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PACIFIC OCEANIC FISHERY
INVESTIGATIONS

AMPHIPODA

By

K. H. BARNARD, D.Sc., F.L.S.

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AMPHIPODA

By K. H. Barnard, D.Sc., F.L.S.

(Plate I and text-figs 1–174.)

INTRODUCTION

THE collection of Amphipods made during the cruises of the R.S.S. 'Discovery' and the R.S.S. 'William Scoresby,' and by the staff of the Marine Biological Station at South Georgia during the years 1925–7, is a large one, comprising approximately 6600 specimens, of which about 4550 are Gammaridea, 1650 Hyperiidea, and 400 Cyamidea. The Lysianassidae alone are represented by over 1100 specimens. Out of a total number of 179 genera and 326 species, 19 genera and 107 species were considered as new. Of these 17 genera and 18 species were described for the first time in a preliminary notice in *Ann. Mag. Nat. Hist.* (10), VII. pp. 425–30, 1931. There are also 5 new varieties; and 1 new species described from a specimen in the South African Museum.

It would be no exaggeration to describe this collection as the most important brought back by any expedition since the days of the U.S. Exploring Expedition and the 'Challenger.' It is probably the most comprehensive and richest collection from one particular geographical region, certainly as far as concerns the southern hemisphere. Besides the bulk of the collection, which was made in the area specially investigated, a considerable amount of important material was secured on the outward and homeward voyages, and during the two winter cruises to South Africa.

The size of the collection is due to the enthusiasm and energy of the staff. It is evident that no opportunity was lost of making the investigation as thorough as possible. The staff is to be congratulated not only on having obtained so much material, but also on having taken so much care in preserving it. Except for a small minority of specimens, which were unavoidably mutilated by the means of capture, the whole collection is in excellent condition. Moreover, in a large number of instances, colour notes on the living animals, colour sketches, photographs, and biological data were made. The labour thus entailed must have been enormous, when it is remembered that various kinds of animals come up in the dredge or trawl, each of which requires special methods of preservation.

In addition to these words of praise for the staff in general for having amassed such a valuable collection, I have to express my thanks to Dr S. Kemp, the leader of the expedition, for having entrusted me with the examination of it. In accepting the undertaking I was fully aware of the disadvantages attending residence in the southern hemisphere, far from libraries and, even more necessary, the collections made by previous Antarctic expeditions. The importance of examining these type collections was not fully realized until the study of the Discovery collection was under way and difficulties of identification began to crop up.

With the advent of further and larger collections from the Antarctic the earlier descriptions get subjected more and more to the fire of criticism. It is comparatively easy to sort out the specimens into species; the assignation of names, giving due credit to earlier authors, is the difficulty. All praise is due to those who have paved the way in the study of Antarctic and sub-Antarctic Amphipods. It is inevitable that pioneers should leave a few stones, sticks and snags as stumbling-blocks to those who follow. It takes much work to make a well-defined path, and also to arrive at a clear-cut definition of a "species."

It is also inevitable, with an ever more searching analysis of specific characters, that even the most elaborate descriptions will often be found to lack just the precise information which a later student requires.

Therefore, I realize only too well the deficiencies, and no doubt the errors, in the present report. In many instances I have been led to conclusions differing from those of other writers. In some cases I have utilized characters which have not been utilized before, with the result that perhaps it will at first have made confusion worse confounded. This is not really so, but it means that many precious records are not available for the discussion of problems of geographical distribution until the material has been re-examined. The final settlement of such questions must be left to a student who has the opportunity of making a critical study and comparison of the Antarctic material now preserved in the museums at London, Paris and Berlin.

With reference to the times of day of the captures as set out in the Station List, I would like to remark on the convenience in having the hours between sunset and sunrise printed in heavy type. This very greatly facilitates working out the daily bathymetrical migration of certain species.

I also wish to thank Dr W. T. Calman, F.R.S., and Dr Isabella Gordon, of the British Museum, for their kindly help in giving me transcriptions, tracings, and answers to many queries.

When entrusting me with the collection of Terra Nova Amphipods, Dr Calman included also a small collection of specimens made in South Georgia by Major Barrett-Hamilton. The identifications of these have been included as an appendix to the present report with the concurrence of Dr Kemp.

I have also seen some MS. notes on a few Amphipods from the Quest Expedition, by the late Dr Chilton. These do not extend our knowledge of the distribution of the species beyond what is recorded in the present report, with the exception of one species (see *infra*, p. 54), and they are therefore not included here. I have not seen the specimens.

The important paper of Dr Schellenberg (March 1931) on the Gammarids of the Swedish Antarctic Expedition and other collections was received after my MSS. had gone to press[1]. This explains why only the obvious and certain synonyms have been struck out. There are probably other synonyms among the species here described as new, but which are better reserved for more deliberate consideration than can be given in the present circumstances.

[1] Forwarded on February 13 and received by the Discovery Committee on March 10, 1931.

GEAR

In the list of stations the following symbols represent the various kinds of gear used:

B	Oblique.
H	Horizontal.
V	Vertical.
BTS	Small beam trawl. Beam 8 ft. in length (2·45 m.): mesh at cod-end ½ in. (12·5 mm.).
DC	Conical dredge. Mouth 16 in. in diameter (40·5 cm.), with canvas bag.
DL	Large dredge. Light pattern, 4 ft. in length (1·2 m.).
DLH	Large dredge. Heavy pattern, 4 ft. in length (1·2 m.).
DS	Small dredge. 2 ft. in length (0·6 m.).
LH	Hand lines.
N 4–T N 7–T	Nets with mesh of 4 mm. or 7 mm. (0·16 in. or 0·28 in.) attached to back of trawl.
N 70	70 cm. tow-net. Mouth circular, 70 cm. in diameter (27·5 in.): mesh graded, at cod-end 74 to the linear inch.
N 100	1 m. tow-net. Mouth circular, 1 m. in diameter (3·3 ft.): mesh graded, at cod-end 16 to the linear inch. From July 1, 1927, this net was replaced by another, of similar pattern, but with the cod-end made of stramin with 11–12 meshes to the linear inch.
N 200	2 m. tow-net. Mouth circular, 2 m. in diameter (6·6 ft.): mesh graded, at cod-end 4 mm. (0·16 in.).
N 450	4½ m. tow-net. Mouth circular, 4½ m. in diameter (14·8 ft.): mesh graded, at cod-end 7 mm. (0·28 in.).
NC 50	Coarse 50 cm tow-net. Mouth circular, 50 cm in diameter (19·5 in.): 25 meshes to the linear inch.
NCS–D NCS–T	Tow-net of coarse silk, with 16 meshes to the linear inch, attached to trawl or other net.
NH	Hand net.
NHS	High speed tow-net. Mouth 3 in. in diameter (7·5 cm.): mesh 74 to the linear inch.
NRL	Large rectangular net. Frame 8 ft. long and 2¼ ft. wide (2·45 m. × 0·7 m.) with bag of ½ in. mesh (12·5 mm.).
NRM	Medium rectangular net. Frame 4 ft. long and 1¼ ft. wide (1·2 m. × 0·38 m.) with bag of 7 mm. mesh (0·28 in.).
OTC	Commercial otter trawl. Head rope 80 ft. long (24·5 m.): mesh at cod-end 1½ in. (3·8 cm.).
OTL	Large otter trawl. Head rope 40 ft. long (12·2 m.): mesh at cod-end 1¼ in. (3·2 cm.).
RM	Mussel rake.
TNL	Large fish-trap. Rectangular, 4 ft. by 4 ft. by 2½ ft. (1·2 m. × 1·2 m. × 0·75 m.), with netting or wire of ½ in. mesh (12·5 mm.).
TYF	Young fish trawl. Mouth about 20 ft. in circumference (6 m.): bag of stramin with 11–12 meshes to linear inch. Fished until July 1926 with poles and otter-boards, thereafter attached to a circular tow-net frame 2 m. in diameter (6·6 ft.).

LIST OF STATIONS AT WHICH AMPHIPODA WERE COLLECTED, WITH THE SPECIES OBTAINED AT EACH STATION

R.R.S. 'DISCOVERY'

10. x. 25. 41° 37′ N, 12° 30′ W. **N 200.** 0–9000 m.: *Cystisoma pellucidum* (W. Suhm).

11. x. 25. 39° 05′ N, 13° 04′ W. **N 100.** 0 m.: *Phronima atlantica*, Guér.

14. x. 25. 34° 23′ N, 14° 32′ W. **N 70.** 0 m., day: *Corophium bonellii* (M. Edw.); *Oxycephalus clausi*, Bov.; *Caprella equilibra*, Say.

14. x. 25. 33° 37′ N, 14° 39′ W. **N 100.** 0 m.: *Oxycephalus clausi*, Bov.

16. x. 25. 29° 26′ N, 15° 07′ W. **N 200.** 0–900 m.: *Scina crassicornis* (Fabr.); *Phronima sedentaria* (Forsk.); *Rhabdosoma whitei*, Bate. From stomach of *Naucrates ductor*: *Platyscelus ovoides* (Claus).

25. x. 25. 17° 24′ N, 18° 15′ W. From stomach of *Thynnus pelamys*: *Phronima sedentaria* (Forsk.).

28. x. 25. 13° 25′ N, 18° 22′ W. **N 450.** 0–9000 m.: *Scina curvidactyla*, Chevr.; *Cystisoma pellucidum* (W. Suhm); *C. fabricii*, Stebb.; *Phronima sedentaria* (Forsk.).

2. xi. 25. 6° 55′ N, 15° 54′ W. **N 200.** 0–800 m.: *Scina vosseleri*, Tatt.; *Vibilia cultripes*, Voss.; *Cystisoma pellucidum* (W. Suhm); *C. fabricii*, Stebb.

12. xi. 25. 2° 20′ S, 12° 45′ W. **N 100.** 0 m.: *Vibilia viatrix*, Bov.; *Paraphronima gracilis*, Claus; *P. crassipes*, Claus; *Phronima sedentaria* (Forsk.); *P. atlantica*, Guér.; *Phronimella elongata* (Claus); *Phrosina semilunata*, Risso; *Thyropus sphaeroma*, Claus.

13. xi. 25. 3° 50′ S, 12° 54′ W. **N 200.** 0 m.: *Phronima sedentaria* (Forsk.); *P. curvipes*, Voss.

29. xi. 25. 25° 47′ S, 14° 48′ W. **NH.** 0 m.: *Brachyscelus rapax*, Claus.

St. 1. 16. xi. 25. Clarence Bay, Ascension Island. **NRM.** 16–27 m., crl. s. sh.: *Maera ascensionis*, n.sp.; *Ampithoë ?brasiliensis* (Dana).

St. 2. 17. xi. 25. Clarence Bay, Ascension Island. Shore collecting (and from buoy, *sic* on label): *Leucothoë spinicarpa* (Abildg.); *Hyale* sp.; *Ampithoë ?brasiliensis* (Dana).

St. 3. 3. xii. 25. 29° 31′ S, 13° 56′ W. **N 200.** 500–700 m., day: *Phronima sedentaria* (Forsk.).

St. 4. 30. i. 26. Tristan da Cunha. **DL.** 40–46 m.: *Ampithoë brevipes* (Dana); *Jassa pusilla* (Sars); *Parajassa tristanensis* (Stebb.); *Caprella acutifrons*, Latr.; *Pseudaeginella tristanensis* (Stebb.). From stomach of *Perca antarctica*, Blue Fish (see note, p. 27): *Vibilia armata*, Bov.; *Cyllopus magellanicus*, Dana; *Phronima sedentaria* (Forsk.). **N 100.** 0–10 m., day: *Phronima sedentaria* (Forsk.).

St. 5. 31. i. 26. Quest Bay, Tristan da Cunha. **NRM.** 7–12 m., g. r.: *Stenothoë* sp.; *Pontogeneia tristanensis*, n.sp.; *Ischyrocerus anguipes*, Kröy., var. *longimanus*, Hasw. Shore collecting and from stream through settlement: *Orchestia platensis*, Kröy.

St. 6. 1. ii. 26. Tristan da Cunha, 3 miles N 30° E of settlement. **DL.** 80–140 m., r.: *Paramoera tristanensis*, n.sp.

St. 8. 8. ii. 26. 42° 36′ S, 18° 19′ W. **N 200.** 600–700 m., day–night: *Cyphocaris richardi*, Chevr.; *Parandania boecki* (Stebb.). **N 100 H.** 0–10 m., day: *Parathemisto gaudichaudii* (Guér.).

St. 9. 11. ii. 26. 46° 11′ S, 22° 27′ W. **N 200.** 1250 (–0) m., day: *Parandania boecki* (Stebb.); *Parathemisto gaudichaudii* (Guér.). **N 100 H.** 0–5 m., day: *Primno macropa*, Guér. **N 450.** 3500 (–0) m., day: *Lanceola serrata*, Bov.

St. 24. 14. iii. 26. 10 miles N 72° E of Jason Light, South Georgia. **N 100 H.** 60 (–0) m., day: *Parathemisto gaudichaudii* (Guér.).

St. 25. 14. iii. 26. 18 miles N 60° E of Jason Light, South Georgia. **N 100 H.** 0–5 m., night: *Cyllopus lucasii*, Bate.

St. 26. 14. iii. 26. 26·5 miles N 54° E of Jason Light, South Georgia. **N 100 H.** 60 (–0) m., night: *Cyllopus lucasii*, Bate; *Parathemisto gaudichaudii* (Guér.).

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia. **DL.** 110 m., m. r.: *Ampelisca bouvieri*, Chevr.; *Haploöps securiger*, Brnrd.; *Heterophoxus videns*, Brnrd.; *Gnathiphimedia mandibularis*, Brnrd.; *Liljeborgia longicornis*, Schell.; *Methalimedon nordenskjöldi*, Schell.; *Epimeria excisipes*, n.sp.; *Eusirus antarcticus*, Thoms.; *Schraderia gracilis*, Pfr.

St. 30. 16. iii. 26. West Cumberland Bay, South Georgia. **DLH.** 251 m., m. st.: *Aeginoides gaussi*, Schell.

St. 32. 17. iii. 26. 22·8 miles N 70½° E of Jason Light, South Georgia. **N 100 H.** 50 (–0) m., night: *Cyllopus magellanicus*, Dana; *C. lucasii*, Bate.

St. 33. 18. iii. 26. 33 miles N 37° E of Jason Light, South Georgia. **N 100 H.** 50 (–0) m., day: *Parathemisto gaudichaudii* (Guér.). **N 100 H.** 90 (–0) m., day: *Primno macropa*, Guér.

St. 35. 18. iii. 26. 53 miles N 40° E of Jason Light, South Georgia. **N 100 H.** 90 (–0) m., day: *Cyllopus magellanicus*, Dana; *Primno macropa*, Guér. **N 100 H.** 50 (–0) m., day: *Parathemisto gaudichaudii* (Guér.).

St. 36. 18. iii. 26. 38 miles N 39° E of Jason Light, South Georgia. **N 100 H.** 50 (–0) m., night: *Vibilia antarctica*, Stebb. 90 (–0) m., night: *Vibilia antarctica*, Stebb.; *Cyllopus lucasii*, Bate; *Hyperia spinigera*, Bov.; *Parathemisto gaudichaudii* (Guér.). 0–5 m., night: *Cyllopus magellanicus*, Dana; *C. lucasii*, Bate; *Parathemisto gaudichaudii* (Guér.).

St. 37. 18–19. iii. 26. 28 miles N 36° E of Jason Light, South Georgia. **N 100 H.** 50 (–0) m., night: *Cyllopus magellanicus*, Dana; *C. lucasii*, Bate.

St. 38. 19. iii. 26. 18·5 miles N 33° E of Jason Light, South Georgia. **N 100 H.** 0–5 m., night: *Cyllopus lucasii*, Bate. 90 (–0) m., night: *Primno macropa*, Guér.

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia. **OTL.** 179–235 m., gy.m.: *Acidostomella cultrifera*, Schell.; *Orchomenella rossi* (Wlkr.); *O. macronyx*, Chevr.; *Pachychelium davidis*, Steph.; *Andaniotes linearis*, n.sp.; *Parharpinia rotundifrons*, n.sp.; *Leucothoë spinicarpa* (Abildg.); *Seba antarctica*, Wlkr.; *Metopella ovata* (Stebb.); *Colomastix fissilingua*, Schell.; *Acanthonotozomella oatesi*, Brnrd.; *Epimeria intermedia*, Schell.; *Polycheria antarctica* (Stebb.); *Eurystheus purpurescens*, n.sp.; *Caprellinoides mayeri* (Pfr.); *Dodecas reducta*, n.sp.; *Aeginoides gaussi*, Schell.

St. 41. 28. iii. 26. 16½ miles N 39° E of Barff Point, South Georgia. **N 70.** 240–150 m., day: *Pseudorchomene coatsi* (Chilton); *Halice profundi*, n.sp.; *Parathemisto gaudichaudii* (Guér.). 100–50 m., day: *Parathemisto gaudichaudii* (Guér.).

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia. **N 7–T** and **OTL.** 120–204 m., m.: *Aristias antarcticus*, Wlkr.; *Lepidepecreella ovalis*, n.sp.; *Orchomenella rossi* (Wlkr.); *O. macronyx*, Chevr.; *Pseudorchomene coatsi* (Chilton); *Andaniotes linearis*, n.sp.; *Ampelisca eschrichtii* Kröy.; *A. macrocephala*, Lilj.; *Haploöps securiger*, Brnrd.; *Leucothoë spinicarpa* (Abildg.); *Proboloides typica* (Wlkr.); *P. carinata*, Schell.; *P. crenatipalmatus* (Stebb.); *Iphimediella margueritei*, Chevr.; *Gnathiphimedia macrops*, n.sp.; *Pagetina genarum*, Brnrd.; *Oediceroides macrodactylus*, Schell.; *Epimeria excisipes*, n.sp.; *Parepimeria crenulata*, Chevr.; *Melphidippa antarctica*, Schell.; *Eurystheus distichon*, Brnrd.; *Podocerus* sp.; *Caprellinoides mayeri* (Pfr.); *Dodecasella elegans*, Brnrd.; *Aeginoides gaussi*, Schell.

St. 44. 3. iv. 26. 32 miles N 51° E of Jason Light, South Georgia. **N 100 H.** 0–5 m., night: *Cyllopus lucasii*, Bate.

St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia. **N 4–T** and **NCS–T.** 238–270 m., gy.m.: *Aristias antarcticus*, Wlkr.; *Tryphosa kergueleni* (Miers); *Lepidepecreella ovalis*, n.sp.; *Orchomenella rossi* (Wlkr.); *O. macronyx*, Chevr.; *Pseudorchomene coatsi* (Chilton); *Pagetina genarum*, Brnrd.; *Halice profundi*, n.sp.; *Oediceroides calmani*, Wlkr.; *O. macrodactylus*, Schell.; *Syrrhoë psychrophila*, Monod; *Epimeria puncticulata*, Brnrd.; *Melphidippa antarctica*, Schell.; *Paraceradocus miersii* (Pfr.); *Eurystheus dimorphus*, n.sp.; *E. distichon*, Brnrd.; *Dodecasella elegans*, Brnrd.

St. 46. 21. iv. 26. 51° 13′ S, 49° 50′ W. **N 100 H.** 0–5 m., night: *Vibilia antarctica*, Stebb.

St. 47. 23. iv. 26. 50° 55′ S, 54° 38′ W. **N 100 H.** 0–5 m., night: *Vibilia antarctica*, Stebb.; *Cyllopus magellanicus*, Dana; *Parathemisto gaudichaudii* (Guér.).

St. 49. 3. v. 26. 13·5 miles N 51° E of Cape Bougainville, East Falkland Island. **N 100 H.** 0–5 m., night: *Vibilia antarctica*, Stebb.; *Parathemisto gaudichaudii* (Guér.).

St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Island. **DLH, OTL,** and **N 4–T.** 105–115 m., f.s.: *Amaryllis macrophthalma*, Hasw.; *Tryphosites chevreuxi*, Stebb.; *Orchomenella cavimanus* (Stebb.); *Urothoë falcata*, Schell.; *Leucothoë spinicarpa* (Abildg.); *Seba saundersii*, Stebb.; *Proboloides porcellanus*, n.sp.; *Colomastix castellata*, n.sp.; *Labriphimedia vespuccii*, Brnrd.; *Liljeborgia longicornis*, Schell.; *Monoculodes vallentini* (Stebb.); *Chosroës incisus*, Stebb.; *Rhachotropis antarctica*, n.sp.; *Atyloella dentata*, n.sp.; *Polycheria antarctica* (Stebb.); *Eurystheus remipes*, n.sp.; *Podocerus ? brasiliensis* (Dana); *Parathemisto gaudichaudii* (Guér.).

St. 53. 12. v. 26. Port Stanley, East Falkland Island. Hulk of 'Great Britain.' 0–2 m., kelp roots: *Pariphimedia normani* (Cunn.); *Panoploea macrocystidis*, n.sp.; *Halirages huxleyanus* (Bate); *Haplocheira robusta*, n.sp.; *Ampithoë brevipes* (Dana).

St. 54. 15. v. 26. Port Stanley, East Falkland Island. Shore collecting: *Paramoera obliquimanus*, n.sp.; *Haplocheira robusta*, n.sp.; *Corophium cylindricum* (Say).

St. 55. 16. v. 26. Entrance to Port Stanley, East Falkland Island. **BTS.** 10–16 m.; *Acontiostoma marionis*, Stebb.; *Halirages huxleyanus* (Bate); *Eurystheus eurypodii*, n.sp.; *Ampithoë brevipes* (Dana).

St. 56. 16. v. 26. Sparrow Cove, Port William, East Falkland Island. **BTS.** 10½–16 m.: *Halirages huxleyanus* (Bate); *H. regis* (Stebb.); *Pontogeneia simplex* (Dana); *Atyloella magellanica* (Stebb.); *Ampithoë brevipes* (Dana).

St. 57. 16. v. 26. Port William, East Falkland Island. **BTS** and **NCS–T.** 15 m.: *Liljeborgia kinahani* (Bate) var. *falklandica* n.

St. 58. 19. v. 26. Port Stanley, Falkland Islands. **RM.** 1–2 m., piles of jetty: *Pachychelium davidis*, Steph.; *Atyloella magellanica* (Stebb.); *Haplocheira robusta*, n.sp.

St. 62. 22. v. 26. 49° 22′ S, 54° 48′ W. **N 100 H.** 45 (–0) m., night: *Vibilia antarctica*, Stebb. **N 100 H.** 90 (–0) m., night: *Phronima sedentaria* (Forsk.).

St. 64. 22. v. 26. 48° 34′ S, 53° 34′ W. **N 100 H.** 0–5 m., night: *Platyscelus ovoides* (Claus).

St. 66. 23. v. 26. 48° 09′ S, 52° 50′ W. **N 100 H.** 0–5 m., night: *Cyllopus magellanicus* Dana. **N 100 H.** 45 (–0) m., night: *Hemityphis rapax* (M. Edw.).

St. 67. 23. v. 26. 47° 18′ S, 51° 52′ W. **N 70 H.** 45 (–0) m., day: *Vibilia australis*, Stebb.; *Cyllopus magellanicus*, Dana.

St. 69. 25. v. 26. 45° 06′ S, 49° 00′ W. **N 100 H.** 90 (–0) m., night: *Vibilia viatrix*, Bov.; *Paraphronima crassipes*, Claus.

St. 71. 30. v. 26. 43° 20′ S, 46° 02′ W. **TYF.** 2000 (–0) m., day: *Cyphocaris richardi*, Chevr.; *Parandania boecki* (Stebb.); *Eusiroides stenopleura*, n.sp.; *Micromimonectes irene*, Wolt.; *Lanceola serrata*, Bov.; *Scina curvidactyla*, Chevr.; *Vibilia antarctica*, Stebb.; *V. armata*, Bov.; *V. pyripes*, Bov.; *Cyllopus magellanicus*, Dana; *Cystisoma fabricii*, Stebb.; *Parathemisto gaudichaudii* (Guer.); *Phronima sedentaria* (Forsk.); *Primno macropa*, Guér.

St. 72. 1. vi. 26. 41° 43′ S, 42° 20′ W. **N 450.** 2000 (–0) m., night: *Cyphocaris richardi*, Chevr.; *Parandania boecki* (Stebb.); *Lanceola remipes*, n.sp.; *Parathemisto gaudichaudii* (Guér.); *Phronima sedentaria* (Forsk.).

St. 76. 5. vi. 26. 39° 50′ S, 36° 23′ W. **N 450.** 1500 (–0) m., day: *Cyphocaris richardi*, Chevr.; *Parandania boecki* (Stebb.); *Lanceola pacifica*, Stebb.; *Scina curvidactyla*, Chevr.; *Vibilia viatrix*, Bov.; *Phronima sedentaria* (Forsk.).

St. 78. 12. vi. 26. 35° 18′ S, 19° 01′ W. **TYF.** 1000 (–0) m., day: *Cyphocaris richardi*, Chevr.; *C. anonyx*, Boeck; *C. challengeri*, Stebb.; *Metacyphocaris helgae*, Tatt.; *Katius obesus*, Chevr.; *Parandania boecki* (Stebb.); *Lanceola serrata*, Bov.; *Scina curvidactyla*, Chevr.; *S. incerta*, Chevr.; *S. borealis* (Sars); *Vibilia armata*, Bov.; *Paraphronima crassipes*, Claus; *Cystisoma pellucidum* (W. Suhm); *Parathemisto gaudichaudii* (Guér.); *Primno macropa*, Guér.

St. 80. 17. vi. 26. 32° 46′ S, 10° 00′ W. **N 200 H.** 30–0 m., night: *Scina crassicornis* (Fabr.).

St. 81. 18. vi. 26. 32° 45′ S, 8° 47′ W. **N 450 H.** 650 (–0) m., day: *Cyphocaris richardi*, Chevr.; *C. anonyx*, Boeck; *C. faurei*, Brnrd.; *Lanceola pacifica*, Stebb.; *Scina crassicornis* (Fabr.); *S. submarginata*, Tatt.; *Vibilia armata*, Bov.; *V. cultripes*, Voss.; *Cyllopus magellanicus*, Dana; *Cystisoma fabricii*, Stebb.; *Phronima sedentaria* (Forsk.); *P. curvipes*, Voss.; *Parascelus typhoides*, Claus.

St. 83. 21. vi. 26. 32° 30′ S, 1° 23′ W. **N 200 H.** 650 (–0) m., night: *Cyphocaris challengeri*, Stebb.; *C. faurei*, Brnrd.; *Scina crassicornis* (Fabr.); *Brachyscelus crusculum*, Bate; *Platyscelus ovoides* (Claus).

St. 84. 22. vi. 26. 32° 52′ S, 1° 55′ E. **NCS–D.** 2000–0 m., night: *Cyphocaris richardi*, Chevr.; *Vibilia viatrix*, Bov.; *Paraphronima gracilis*, Claus; *Hyperioides longipes*, Chevr.

St. 85. 23. vi. 26. 33° 07′ S, 4° 30′ E. **N 450 H.** 2000 (–0) m., night: *Metacyphocaris helgae*, Tatt.; *Parandania boecki* (Stebb.); *Euandania gigantea* (Stebb.); *Scypholanceola vanhoeffeni*, Wolt.; *Scina curvidactyla*, Chevr.; *Pegohyperia princeps*, Brnrd.; *Phronima sedentaria* (Forsk.). **N 70 V.** 500–0 m., day: *Platyscelus ovoides* (Claus).

St. 86. 24. vi. 26. 33° 25′ S, 6° 31′ E. **N 450 H.** 1000 (–0) m., day: *Cyphocaris richardi*, Chevr.; *C. faurei*, Brnrd.; *Lanceola serrata*, Bov.; *L. pacifica*, Stebb.; *Scypholanceola vanhoeffeni*, Wolt.; *Scina crassicornis* (Fabr.); *Phronima sedentaria* (Forsk.); *Streetsia challengeri*, Stebb.

St. 87. 25. vi. 26. 33° 53′ S, 9° 26′ E. **TYF.** 1000 (–0) m., day: *Cyphocaris anonyx*, Boeck; *C. challengeri*, Stebb.; *Andaniexis australis*, n.sp.; *Stenopleura atlantica*, Stebb.; *Eusirella elegans*, Chevr.; *Scypholanceola vanhoeffeni*, Wolt.; *Parascina fowleri*, Stebb.; *Scina crassicornis* (Fabr.); *S. incerta*, Chevr.; *S. borealis* (Sars); *S. uncipes*, Stebb. f. *spinosa*, Voss.; *S. tullbergi* (Bov.); *Vibilia viatrix*, Bov.; *V. propinqua*, Stebb.; *V. armata*, Bov.; *Paraphronima crassipes*, Claus; *Hyperioides longipes*, Chevr.; *Phronima atlantica*, Guér.; *P. pacifica*, Streets; *Parapronoë campbelli*, Stebb.; *Streetsia challengeri*, Stebb.; *Hemityphis rapax* (M. Edw.).

St. 88. 27. vi. 26. 34° 04′ S, 13° 00′ E. **N 100 H.** 3000–0 m., day: *Vibilia armata*, Bov.; *Hyperioides longipes*, Chevr.; *Phronima sedentaria* (Forsk.).

St. 89. 28. vi. 26. 34° 05′ S, 16° 00′ E. **TYF.** 1000 (–0) m., day: *Cyphocaris richardi*, Chevr.; *C. anonyx*, Boeck; *C. challengeri*, Stebb.; *Andaniexis australis*, n.sp.; *Synopioides macronyx*, Stebb.; *Stenopleura atlantica*, Stebb.; *Lanceola serrata*, Bov.; *Scypholanceola vanhoeffeni*, Wolt.; *Scina crassicornis* (Fabr.); *S. incerta*, Chevr.; *S. langhansi*, Wagl.; *S. borealis* (Sars); *S. uncipes*, Stebb. f. *affinis*, Wagl.; *S. oedicarpus*, Stebb.; *Vibilia propinqua*, Stebb.; *V. armata*, Bov.; *Cyllopus magellanicus*, Dana; *Paraphronima crassipes*, Claus; *Hyperioides longipes*, Chevr.; *Dairella latissima*, Bov.; *Phronima atlantica*, Guér.; *Phrosina semilunata*, Risso; *Primno macropa*, Guér.; *Eupronoë minuta*, Claus; *Lycaea nasuta*, Claus; *Brachyscelus crusculum*, Bate; *Platyscelus ovoides* (Claus); *Hemityphis rapax* (M. Edw.).

St. 90. 10. vii. 26. Simon's Town, False Bay, South Africa. **NRM.** 10–12 m.: *Lysianassa variegata* (Stmpsn); *Ampelisca palmata*, Brnrd.; *Liljeborgia kinahani* (Bate) var. *capensis* n.; *Melita inaequistylis* (Dana).

St. 91. 8. ix. 26. Off Roman Rock, False Bay, South Africa. **NRL.** 35 m., s.: *Amaryllis macrophthalma*, Hasw.; *Lysianassa variegata* (Stmpsn); *Tryphosa onconotus*, Stebb.; *Ampelisca brevicornis*, Costa; *Phylluropus capensis*, n.sp.; *Aora typica*, Kröy., var. *gibbula* n.; *Lemboides afer*, Stebb.; *Photis uncinata*, n.sp.; *Eurystheus palmoides*, n.sp.

St. 101. 14. x. 26. 33° 50′–34° 13′ S, 16° 04′–15° 49′ E. **N 450.** 850–950 m., day: *Cyphocaris richardi*, Chevr.; *Katius obesus*, Chevr.; *Lanceola pacifica*, Stebb.; *Phronima sedentaria* (Forsk.). **N 450.** 1310–1410 m., day: *Cyphocaris richardi*, Chevr.; *Parandania boecki* (Stebb.); *Lanceola serrata*, Bov.; *Parathemisto gaudichaudii* (Guér.); *Phronima sedentaria* (Forsk.). 15. x. 26. **N 450 H.** 350–400 (–0) m., night: *Phronima sedentaria* (Forsk.); *Phrosina semilunata*, Risso; *Anchylomera blossevillei*, M. Edw.; *Brachyscelus crusculum*, Bate; *Oxycephalus clausi*, Bov.

St. 103. 30. x. 26. 39° 04′ S, 17° 38′ E. **N 70 V.** 500–250 m., day: *Paraphronima crassipes*, Claus.

St. 105. 3. xi. 26. 44° 32′ S, 18° 17′ E. **N 100 H.** 117 m., day: *Primno macropa*, Guér.

St. 107. 4. xi. 26. 45° 03′ S, 17° 03′ E. **N 450.** 850–950 m., day: *Cyphocaris richardi*, Chevr.; *C. faurei*, Brnrd.; *Katius obesus*, Chevr.; *Parandania boecki* (Stebb.); *Lanceola serrata*, Bov.

St. 114. 12. xi. 26. 52° 25′ S, 9° 50′ E. **N 450.** 1310–1410 m., day: *Cyphocaris richardi*, Chevr.; *Parandania boecki* (Stebb.); *Eusiroides stenopleura*, n.sp.; *Lanceola serrata*, Bov.

St. 116. 14. xi. 26. 50° 30′ S, 5° 34′ E. **N 100 H.** 55 m., night: *Eusirus microps*, Wlkr.; *Vibilia antarctica*, Stebb.; *Cyllopus magellanicus*, Dana; *Hyperiella dilatata*, Stebb.; *Parathemisto gaudichaudii* (Guér.).

St. 120. 22. xi. 26. 51° 44′ S, 5° 19′ W. **N 100 H.** 575–675 m., day: *Scina borealis* (Sars); *Vibilia antarctica*, Stebb.; *Parathemisto gaudichaudii* (Guér.); *Primno macropa*, Guér.

St. 122. 14. xii. 26. Maiviken, West Cumberland Bay, South Georgia. Shore collecting: *Talorchestia scutigerula* (Dana).

St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia. **N 4–T** and **OTL.** 230–250 m., gy.m.: *Shackletonia robusta*, Brnrd.; *Tryphosa kergueleni* (Miers); *Orchomenella rossi* (Wlkr.); *O. macronyx*, Chevr.; *Ampelisca macrocephala*, Lilj.; *Haploöps securiger*, Brnrd.; *Proboloides typica* (Wlkr.); *P. carinata*, Schell.; *P. crenatipalmatus* (Stebb.); *Gnathiphimedia mandibularis*, Brnrd.; *G. sexdentata* (Schell.); *Oediceroides macrodactylus*, Schell.; *Oradarea tridentata*, n.sp.; *Austropleustes simplex*, n.sp.; *Epimeria excisipes*, n.sp.; *E. puncticulata*, Brnrd.; *Parepimeria crenulata*, Chevr.; *Eclysis similis*, n.g., n.sp.; *Melphidippa antarctica*, Schell.; *Eusirus antarcticus*, Thoms.; *Maera pfefferi*, n.sp.; *Paraceradocus miersii* (Pfr.); *Eurystheus dimorphus*, n.sp.; *E. distichon*, Brnrd.; *E. serricrus*, n.sp.; *Megamphopus blaisus*, n.sp.; *Dodecasella elegans*, Brnrd.; *Aeginoides gaussi*, Schell.

St. 125. 18–19. xii. 26. 53° 28′ S, 36° 20′ W. **N 100 H.** 0–5 m., night: *Vibilia antarctica*, Stebb.; *Hyperoche medusarum* (Kröy.); *Parathemisto gaudichaudii* (Guér.).

St. 128. 19. xii. 26. 53° 38′ S, 37° 08′ W. **N 100 H.** 50 (–0) m., day: *Parathemisto gaudichaudii* (Guér.).

St. 129. 19. xii. 26. 53° 28′ S, 37° 08′ W. **N 100 H.** 84 (–0) m., night: *Vibilia antarctica*, Stebb.; **N 100 H.** 0–5 m., night: *Vibilia antarctica*, Stebb.

St. 130. 20. xii. 26. 54° 06′ S, 36° 23′ W. **N 100 H.** 38 m., day: *Hyperoche medusarum* (Kröy.).

St. 132. 20. xii. 26. 53° 52′ S, 35° 58′ W. **N 100 H.** 38 m., day: *Parathemisto gaudichaudii* (Guér.).

St. 133. 20–21. xii. 26. 53° 45′ S, 35° 46′ W. **N 100 H.** 0–5 m., night: *Vibilia antarctica*, Stebb. **N 100 H.** 100 m., night: *Vibilia antarctica*, Stebb.

St. 136. 21. xii. 26. 54° 22′ S, 35° 21′ W. **N 100 H.** 0–5 m., night: *Parharpinia obliqua*, n.sp.; *Vibilia antarctica*, Stebb.; *Parathemisto gaudichaudii* (Guér.). **N 100 H.** 99 (–0) m., night: *Vibilia antarctica*, Stebb.

St. 137. 22. xii. 26. 54° 19′ S, 35° 03′ W. **N 100 H.** 66 m., day: *Vibilia antarctica*, Stebb.; *Parathemisto gaudichaudii* (Guér.).

St. 138. 22. xii. 26. 54° 17′ S, 34° 47′ W. **N 100 H.** 77 m., day: *Vibilia antarctica*, Stebb.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia. **N 4–T.** 122–136 m., gn.m. st.: *Uristes gigas*, Dana; *Tryphosa kergueleni* (Miers); *T. triangularis*, n.sp.; *Lepidepecreella ovalis*, n.sp.; *Ampelisca bouvieri*, Chevr.; *Haploöps securiger*, Brnrd.; *Seba antarctica*, Wlkr.; *Proboloides crenatipalmatus* (Stebb.); *Gnathiphimedia mandibularis*, Brnrd.; *Echiniphimedia hodgsoni* (Wlkr.); *E. echinata* (Wlkr.); *Monoculodes scabriculosus*, n.sp.; *Methalimedon nordenskjöldi*, Schell.; *Syrrhoë psychrophila*, Monod; *Epimeria excisipes*, n.sp.; *E. puncticulata*, Brnrd.; *E. intermedia*, Schell.; *Parepimeria crenulata*, Chevr.; *Melphidippa antarctica*, Schell.; *Eusirus antarcticus*, Thoms.; *Eurystheus dimorphus*, n.sp.; *E. serricrus*, n.sp.; *Megamphopus blaisus*, n.sp.; *Haplocheira barbimanus* (Thoms.); *Dodecasella elegans*, Brnrd.

St. 141. 29. xii. 26. East Cumberland Bay, South Georgia. **BTS.** 17–27 m., m.: *Tryphosa triangularis*, n.sp.; *Orchomenella acanthurus* (Schell.); *Parharpinia rotundifrons*, n.sp.; *Oradarea tridentata*, n.sp.; *Eusiroides georgianus*, n.sp.; *Djerboa furcipes*, Chevr.; *Schraderia gracilis*, Pfr.; *Paradexamine fissicauda*, Chevr.; *Megamphopus blaisus*, n.sp.; *Haplocheira barbimanus* (Thoms.).

St. 142. 30. xii. 26. East Cumberland Bay, South Georgia. **NCS–T** and **OTL.** 88–273 m., m.: *Allogaussia lobata*, n.sp.; *Orchomenella rossi* (Wlkr.); *Pseudorchomene coatsi* (Chilton); *Seba antarctica*, Wlkr.; *Halice profundi*, n.sp.; *Oradarea tridentata*, n.sp.; *Epimeria intermedia*, Schell.; *Polycheria antarctica* (Stebb.); *Didymochelia spongicola*, Brnrd.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia. **N 4–T** and **NCS–T.** 155–178 m., gn.m. s.: *Uristes gigas*, Dana; *Tryphosa kergueleni* (Miers); *T. triangularis*, n.sp.; *T. analogica*, n.sp.; *Andaniotes linearis*, n.sp.; *Ampelisca eschrichtii*, Kröy.; *Haploöps securiger*, Brnrd.; *Proboloides typica* (Wlkr.); *P. crenatipalmatus* (Stebb.); *Acanthonotozomella oatesi*, Brnrd.; *Gnathiphimedia mandibularis*, Brnrd.; *Liljeborgia longicornis*, Schell.; *Paraperioculodes brevimanus*, Brnrd.; *Oediceroides macrodactylus*, Schell.; *Syrrhoë psychrophila*, Monod; *Oradarea tricarinata*, n.sp.; *Epimeria excisipes*, n.sp.; *Parepimeria crenulata*, Chevr.; *Melphidippa antarctica*, Schell.; *Eusirus antarcticus*, Thoms.; *Rhachotropis antarctica*, n.sp.; *Schraderia gracilis*, Pfr.; *Maera pfefferi*, n.sp.; *Polycheria antarctica* (Stebb.); *Eurystheus dimorphus*, n.sp.; *E. distichon*, Brnrd.; *Megamphopus blaisus*, n.sp.; *Haplocheira barbimanus* (Thoms.); *Dodecasella elegans*, Brnrd.

St. 145. 7. i. 27. Stromness Harbour, South Georgia. **BTS.** 26–35 m., weedy ground: *Cheirimedon femoratus* (Pfr.); *Tryphosa triangularis*, n.sp.; *Orchomenella acanthurus* (Schell.); *Gnathiphimedia mandibularis*, Brnrd.; *Liljeborgia kinahani* (Bate) var. *georgiensis* n.; *Oediceroides calmani*, Wlkr.; *Oradarea tridentata*, n.sp.; *Djerboa furcipes*, Chevr.; *Schraderia gracilis*, Pfr.

St. 146. 8. i. 27. 53° 48′ S, 35° 37′ W. **DLH.** 728 m., r.: *Haploöps securiger*, Brnrd.

St. 148. 9. i. 27. Off Cape Saunders, South Georgia. **N 4–T.** 132–148 m., gy.m. st.: *Andaniotes linearis*, n.sp.; *Gnathiphimedia mandibularis*, Brnrd.; *G. sexdentata* (Schell.); *Echiniphimedia hodgsoni* (Wlkr.); *E. echinata* (Wlkr.); *Oediceroides macrodactylus*, Schell.; *Epimeria excisipes*, n.sp.; *E. puncticulata*, Brnrd.; *Melphidippa antarctica*, Schell.; *Eurystheus dimorphus*, n.sp.

St. 149. 10. i. 27. Mouth of East Cumberland Bay, South Georgia. **N 4–T** and **OTL.** 200–234 m., m.: *Aristias antarcticus*, Wlkr.; *Orchomenella rossi* (Wlkr.); *O. macronyx*, Chevr.; *Andaniotes linearis*, n.sp.; *Leucothoë spinicarpa* (Abildg.); *Gnathiphimedia sexdentata* (Schell.); *Echiniphimedia hodgsoni* (Wlkr.); *E. echinata* (Wlkr.); *Oediceroides macrodactylus*, Schell.; *Oradarea tridentata*, n.sp.; *Melphidippa antarctica*, Schell.; *Eusirus antarcticus*, Thoms.; *Eurystheus dimorphus*, n.sp.

St. 151. 16. i. 27. 53° 25′ S, 35° 15′ W. **N 450.** 1025–1275 m., day: *Parandania boecki* (Stebb.). **N 100 H.** 500–625 m., day: *Vibilia antarctica*, Stebb.; *Parathemisto gaudichaudii* (Guer.); *Primno macropa*, Guér.

St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W. **DLH.** 245 m., r.: *Orchomenella cavimanus* (Stebb.); *Proboloides typica* (Wlkr.); *P. crenatipalmatus* (Stebb.); *Parepimeria crenulata*, Chevr.; *Melphidippa antarctica*, Schell.; *Maera pfefferi*, n.sp.; *Aeginoides gaussi*, Schell.

St. 153. 17. i. 27. 54° 08′ S, 36° 27′ W. **DLH.** 106 m., r.: *Ampelisca bouvieri*, Chevr.; *Haploöps securiger*, Brnrd.

St. 154. 18. i. 27. Jason Harbour to Larsen Point, South Georgia. **N 4–T.** 60–160 m., m.: *Orchomenella rossi* (Wlkr.); *Pseudorchomene coatsi* (Chilton); *Paraperioculodes brevimanus*, Brnrd.; *Eurystheus dimorphus*, n.sp.

St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W. **DLH.** 200–236 m., r.: *Uristes gigas*, Dana; *Tryphosa analogica*, n.sp.; *Andaniotes linearis*, n.sp.; *Heterophoxus videns*, Brnrd.; *Acanthonotozomella oatesi*, Brnrd.; *Gnathiphimedia sexdentata* (Schell.); *Syrrhoë psychrophila*, Monod; *Epimeria excisipes*, n.sp.; *Maera pfefferi*, n.sp.

St. 158. 21. i. 27. 53° 48′ S, 35° 57′ W. **DLH.** 401–411 m., r.: *Phippsiella rostrata*, n.sp.; *Echiniphimedia hodgsoni* (Wlkr.).

St. 159. 21. i. 27. 53° 52′ S, 36° 08′ W. **DLH.** 160 m., r.: *Ambasiopsis georgiensis*, Brnrd.; *Uristes gigas*, Dana; *Tryphosa major*, n.sp.; *T. triangularis*, n.sp.; *T. analogica*, n.sp.; *Tmetonyx longitelson*, n.sp.; *Parharpinia sinuata*, n.sp.; *Gnathiphimedia mandibularis*, Brnrd.; *Liljeborgia longicornis*, Schell.; *Oediceroides calmani*, Wlkr.; *Epimeria excisipes*, n.sp.; *Eusiroides georgianus*, n.sp.; *Schraderia gracilis*, Pfr.; *Maera pfefferi*, n.sp.; *Eurystheus distichon*, Brnrd.

St. 160. 7. ii. 27. Near Shag Rocks, 53° 43′ S, 40° 57′ W. **DLH.** 177 m., gy.m. st. r.: *Acidostomella cultrifera*, Schell.; *Stomacontion insigne*, n.sp.; *Proboloides typica* (Wlkr.); *Liljeborgia longicornis*, Schell.; *Eurystheus distichon*, Brnrd.

St. 162. 17. ii. 27. Off Signy Island, South Orkneys. **DLH.** 320 m., gn.m.: *Harpinia cariniceps*, n.sp.; *Epimeriella macronyx*, Wlkr.

St. 164. 18. ii. 27. East end of Normanna Strait, South Orkneys. **NCS–T.** 24–36 m.: *Cardenio paurodactylus*, Stebb.; *Metopella ovata* (Stebb.); *Monoculodes scabriculosus*, n.sp.; *Liouvillea oculata*, Chevr.; *Kuphocheira setimanus*, Brnrd.; *Jassa falcata* (Mont.).

St. 165. 18–20. ii. 27. Dove Strait, Signy Island, South Orkneys. **TNL.** 24–36 m., from stomach of *Notothenia*: *Cheirimedon femoratus* (Pfr.); *Tryphosa kergueleni* (Miers); *Lepidepecreum cingulatum*, n.sp.; *Pontogeneiella brevicornis* (Chevr.).

St. 166. 19. ii. 27. SE point of Paul Harbour, Signy Island, South Orkneys. Shore collecting: *Pontogeneia antarctica*, Chevr.

St. 167. 20. ii. 27. Off Signy Island, South Orkneys. **N 7–T** and **N 4–T.** 244–344 m., gn.m.: *Harpinia cariniceps*, n.sp.; *Monoculodes antarcticus*, n.sp.; *Oediceroides calmani*, Wlkr.; *Eusirus antarcticus*, Thoms.; *E. perdentatus*, Chevr.; *Rhachotropis antarctica*, n.sp.; *Paraceradocus miersii* (Pfr.); *Eurystheus purpurescens*, n.sp.

St. 169. 22. ii. 27. 60° 48′ S, 51° 00′ W. **TYF.** 1000–1100 m., day: *Vibilia antarctica*, Stebb.; *Cyllopus lucasii*, Bate.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island. 61° 25′ S, 53° 46′ W. **DLH.** 342 m., r.: *Shackletonia robusta*, Brnrd.; *Waldeckia obesa* (Chevr.); *Aristias antarcticus*, Wlkr.; *A. collinus*, n.sp.; *Ambasiopsis uncinata*, n.sp.; *Tryphosella albina*, n.sp.; *Tryphosa major*, n.sp.; *Tmetonyx carinata* (Schell.); *Allogaussia navicula*, n.sp.; *A. lobata*, n.sp.; *Ampelisca hemicryptops*, Brnrd.; *Byblis antarctica*, Schell.; *Haploöps securiger*, Brnrd.; *Leucothoë spinicarpa* (Abildg.); *Gnathiphimedia sexdentata* (Schell.); *Echiniphimedia hodgsoni* (Wlkr.); *Liljeborgia longicornis*, Schell.; *Syrrhoë nodulosa*, n.sp.; *Syrrhoites anaticauda*, Brnrd.; *Clarencia chelata*, Brnrd.; *Chosroës decoratus*, n.sp.; *Oradarea impressicauda*, n.sp.; *Austropleustes cuspidatus*, Brnrd.; *Epimeria macrodonta*, Wlkr. f. *similis*, Chevr.; *E. inermis*, Wlkr.; *E. excisipes*, n.sp.; *Epimeriella walkeri*, Brnrd.; *Parepimeria crenulata*, Chevr.; *P. crenulata*, Chevr. var. *miothele* n.; *Lepechinella cetrata*, n.sp.; *Eusirus perdentatus*, Chevr.; *Eusiroides georgianus*, n.sp.; *Rhachotropis antarctica*, n.sp.; *Eurystheus serricrus*, n.sp.; *Podoceropsis elephantis*, n.sp.; *Jassa ingens* (Pfr.); *Pseuderichthonius gaussi*, Schell.

St. 172. 26. ii. 27. Off Deception Island, South Shetlands. 62° 59′ S, 60° 28′ W. **DLH.** 525 m., r.: *Waldeckia obesa* (Chevr.); *Oradarea tricarinata*, n.sp.

St. 173. 28. ii. 27. Port Foster, Deception Island, South Shetlands. **NCS–T.** 5–60 m.: *Cheirimedon femoratus* (Pfr.); *Orchomenella rossi* (Wlkr.); *Monoculodes scabriculosus*, n.sp.; *Oradarea edentata*, n.sp.; *Pontogeneiella brevicornis* (Chevr.); *Prostebbingia gracilis* (Chevr.); *Paramoera walkeri* (Stebb.); *P. edouardi*, Schell.

St. 174. 28. ii.–2. iii. 27. Deception Island, South Shetlands. **TNL.** 5–10 m.: *Cheirimedon femoratus* (Pfr.); *Tryphosa kergueleni* (Miers); *Orchomenella rotundifrons*, n.sp.; *Bovallia gigantea*, Pfr.; *Eurymera monticulosa*, Pfr.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands. 63° 17′ S, 59° 48′ W. **DLH.** 200 m., m. st. g., night: *Kerguelenia palpalis*, n.sp.; *Aristias collinus*, n.sp.; *Uristes gigas*, Dana; *Tryphosa major*, n.sp.; *T. adarei*, Wlkr.; *Allogaussia navicula*, n.sp.; *Orchomenella charcoti* (Chevr.); *Andaniotes linearis*, n.sp.; *Ampelisca hemicryptops*, Brnrd.; *Heterophoxus trichosus*, n.sp.; *Parharpinia obliqua*, n.sp.; *Leucothoë spinicarpa* (Abildg.); *Iphimediella margueritei*, Chevr.; *I. bransfieldi*, n.sp.; *Gnathiphimedia sexdentata* (Schell.); *Echiniphimedia hodgsoni* (Wlkr.); *Monoculodes antarcticus*, n.sp.; *Tiron antarcticus*, n.sp.; *Syrrhoites anaticauda*, Brnrd.; *Liouvillea oculata*, Chevr.; *Oradarea tricarinata*, n.sp.; *Epimeria macrodonta*, Wlkr. f. *similis*, Chevr.; *E. inermis*, Wlkr.; *E. excisipes*, n.sp.; *Parepimeria crenulata*, Chevr.; *Melphidippa antarctica*, Schell.; *Eusirus antarcticus*, Thoms.; *Eusiroides georgianus*, n.sp.; *Rhachotropis antarctica*, n.sp.; *Prostebbingia gracilis* (Chevr.); *Jassa ingens* (Pfr.); *Pseuderichthonius gaussi*, Schell.; *Aeginoides gaussi*, Schell.

St. 177. 5. iii. 27. 27 miles SW of Deception Island, South Shetlands. **DLH.** 1080 m., m. cs.st.: *Lepidepecreoides xenopus*, Brnrd.; *Ampelisca bransfieldi*, n.sp.; *Parepimeria major*, n.sp.

St. 178. 9–10. iii. 27. Melchior Harbour, Schollaert Channel, Palmer Archipelago. **TNL.** 17 m.: *Orchomenella rossi* (Wlkr.).

St. 179. 10. iii. 27. Melchior Island, Schollaert Channel, Palmer Archipelago. **DS.** 4–10 m., r.: *Cheirimedon femoratus* (Pfr.); *Pariphimedia integricauda*, Chevr.; *Bovallia gigantea*, Pfr.; *Eurymera monticulosa*, Pfr.; *Pontogeneia antarctica*, Chevr.; *Prostebbingia gracilis* (Chevr.); *Djerboa furcipes*, Chevr.; *Jassa ingens* (Pfr.).

St. 180. 11. iii. 27. Off Gand Island, Schollaert Channel, Palmer Archipelago. **DLH.** 160 m., m. st.: *Ampelisca eschrichtii*, Kröy.; *Eusirus perdentatus*, Chevr. **N 7–T.** 160–330 m., m. st.: *Oediceroides calmani*, Wlkr.; *Parathemisto gaudichaudii* (Guér.).

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago. **N 7–T** and **N 4–T.** 160–335 m., m.: *Lepidepecreoides xenopus*, Brnrd.; *Orchomenella rossi* (Wlkr.); *Ampelisca hemicryptops*, Brnrd.; *Byblisoides juxtacornis*, Brnrd.; *Harpinia cariniceps*, n.sp.; *Nicippe unidentata*, n.sp.; *Monoculodes antarctica*, n.sp.; *Oediceroides calmani*, Wlkr.; *Syrrhoë nodulosa*, n.sp.; *Epimeria macrodonta*, Wlkr. f. *macrodonta* and f. *similis*; *Eusirus antarcticus*, Thoms.; *E. perdentatus*, Chevr.; *Rhachotropis antarctica*, n.sp.

St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago. **N 4–T.** 278–500 m., m.: *Nicippe unidentata*, n.sp.; *Monoculodes antarcticus*, n.sp.; *Oediceroides calmani*, Wlkr.; *Syrrhoë nodulosa*, n.sp.; *Epimeria macrodonta*, Wlkr. f. *similis*, Chevr.; *Epimeriella walkeri*, Brnrd.; *Eusirus antarcticus*, Thoms.; *Rhachotropis antarctica*, n.sp.; *Podocerus septemcarinatus*, Schell.

St. 184. 15–16. iii. 27. Fournier Bay, Anvers Island, Palmer Archipelago. **TNL.** 36 m.: *Waldeckia obesa* (Chevr.); *Orchomenella rossi* (Wlkr.).

St. 186. 16. iii. 27. Fournier Bay, Anvers Island, Palmer Archipelago. **DLH.** 295 m., m.: *Ampelisca hemicryptops*, Brnrd.; *Byblisoides juxtacornis*, Brnrd.; *Harpinia cariniceps*, n.sp.; *Eusirus perdentatus*, Chevr.

St. 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago. **DLH.** 259 m., m.: *Ampelisca eschrichtii*, Kröy.; *A. hemicryptops*, Brnrd.; *Anchiphimedia dorsalis*, Brnrd.; *Monoculodes antarcticus*, n.sp.; *Rhachotropis antarctica*, n.sp.

St. 189. 21–23. iii. 27. Port Lockroy, Palmer Archipelago. **TNL.** 7 m.: *Orchomenella rossi* (Wlkr.). 23–24. iii. 27. **TNL.** 70 m.: *Waldeckia obesa* (Chevr.); *Orchomenella rossi* (Wlkr.).

St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago. **DLH** and **NRL.** 90–130 m., st. m. r.: *Cheirimedon femoratus* (Pfr.); *Andaniotes linearis*, n.sp.; *Ampelisca hemicryptops*, Brnrd.; *Leucothoë spinicarpa* (Abildg.); *Acanthonotozomella oatesi*, Brnrd.; *Gnathiphimedia sexdentata* (Schell.); *Echiniphimedia hodgsoni* (Wlkr.); *E. echinata* (Wlkr.); *Pardalisca abyssoides*, n.sp.; *Eusirus perdentatus*, Chevr.; *Eurystheus purpurescens*, n.sp.; *Cerapus oppositus*, n.sp.; *Podocerus septemcarinatus*, Schell.; **DLH.** 315 m., m. r.: *Gnathiphimedia sexdentata* (Schell.); *Oediceroides calmani*, Wlkr.; *Epimeria excisipes*, n.sp.; *Eusirus perdentatus*, Chevr.; *Rhachotropis antarctica*, n.sp.; *Pontogeneiella longicornis* (Chevr.).

St. 195. 30. iii. 27. Admiralty Bay, King George Island, South Shetlands. 62° 07′ S, 58° 28′ W. **N 7–T** and **N 4–T.** 391 m., m. st.: *Waldeckia obesa* (Chevr.); *Harpinia cariniceps*, n.sp.; *Heterophoxus videns*, Brnrd.; *Proboloides antarcticus*, Wlkr.; *Panoploea joubini*, Chevr.; *Liljeborgia longicornis*, Schell.; *Oediceroides macrodactylus*, Schell.; *Syrrhoë nodulosa*, n.sp.; *Epimeria excisipes*, n.sp.; *Parepimeria crenulata*, Chevr. var. *miothele* n.; *Eusirus antarcticus*, Thoms.; *E. perdentatus*, Chevr.; *Aeginoides gaussi*, Schell.

St. 196. 3. iv. 27. Bransfield Strait, South Shetlands. 62° 17′ S, 58° 21′ W. **N 70.** 720 m., m. di.oz.: *Urothoides oniscoides*, n.sp.

St. 197. 3. iv. 27. Bransfield Strait, South Shetlands. 62° 27′ S, 58° 11′ W. **N 70 V.** 750–500 m., day: *Cyphocaris richardi*, Chevr.

St. 198. 3. iv. 27. Bransfield Strait, South Shetlands. **N 100 H.** 76 m., night: *Cyphocaris richardi*, Chevr.

St. 202. 5. iv. 27. Bransfield Strait, South Shetlands. 62° 48′ S, 60° 05′ W. **N 100 H.** 0–5 m., night: *Eusirus microps*, Wlkr.

St. 208. 7. iv. 27. Off Livingston Island, South Shetlands. **TYF.** 800 (–0) m., day: *Allogaussia lobata*, n.sp.; *Orchomenella rossi* (Wlkr.); *O. abyssorum* (Stebb.); *Parandania boecki* (Stebb.); *Halice profundi*, n.sp.; *Vibilia antarctica*, Stebb.; *Cyllopus magellanicus*, Dana; *C. lucasii*, Bate; *Parathemisto gaudichaudii* (Guér.).

St. 216. 18. iv. 27. Drake Strait. 58° 53′ S, 67° 55′ W. **N 70 V.** 750–500 m., day: *Cystisoma fabricii*, Stebb.

St. 219. 21. iv. 27. Drake Strait. 57° 32′ S, 67° 04′ W. **N 70 V.** 750–500 m., day: *Cystisoma fabricii*, Stebb.

St. 222. 23–24. iv. 27. St Martin's Cove, Hermite Island, Cape Horn. **TNL** and **NRL.** 30–35 m.: *Amaryllis macrophthalma*, Hasw.; *Tryphosa castellata*, n.sp.; *Tryphosites chevreuxi*, Stebb.; *Nototropis villosus* (Bate); *Paramoera gregaria* (Pfr.); *P. hermitensis*, n.sp. 23. iv. 27. Shore collecting: *Hyalella patagonica*, Ortm. 25. iv. 27. Fresh-water lakes, 300–350 ft.: *Hyalella patagonica*, Ortm.

St. 239. 2. vi. 27. 46° 56′ S, 46° 03′ W. **N 450.** 1050–1350 m., day: *Cyphocaris richardi*, Chevr.; *Parandania boecki* (Stebb.); *Eusiroides stenopleura*, n.sp.; *Lanceola serrata*, Bov.; *Cyllopus magellanicus*, Dana; *Parathemisto gaudichaudii* (Guér.); *Phronima sedentaria* (Forsk.); *Primno macropa*, Guér.

St. 245. 10. vi. 27. 38° 20′ S, 22° 18′ W. **N 450.** 1800–2000 m., day: *Lanceola pacifica*, Stebb.

St. 250. 17. vi. 27. 36° 09′ S, 5° 33′ W. **TYF.** 300 (–0) m., night: *Stenopleura atlantica*, Stebb.; *Scina curvidactyla*, Chevr.; *Phronima sedentaria* (Forsk.); *Streetsia challengeri*, Stebb.

St. 253. 21. vi. 27. 35° 06′ S, 2° 19′ E. **TYF.** 1000–1050 m., day: *Cyphocaris richardi*, Chevr.; *C. anonyx*, Boeck; *Katius obesus*, Chevr.; *Parandania boecki* (Stebb.); *Lanceola serrata*, Bov.

St. 254. 21. vi. 27. 35° 04′ S, 2° 59′ E. **TYF.** 200 (–0) m., night: *Scina crassicornis* (Fabr.); *Phronima sedentaria* (Forsk.); *Phrosina semilunata*, Risso; *Streetsia challengeri*, Stebb.

St. 256. 23. vi. 27. 35° 14′ S, 6° 49′ E. **TYF.** 850–1100 (–0) m., day: *Cyphocaris richardi*, Chevr.; *C. anonyx*, Boeck; *C. faurei*, Brnrd.; *Parandania boecki* (Stebb.); *Synopioides macronyx*, Stebb.; *Stenopleura atlantica*, Stebb.; *Lanceola serrata*, Bov.; *L. pacifica*, Stebb.; *Scypholanceola vanhoeffeni*, Wolt.; *Scina curvidactyla*, Chevr.; *S. incerta*, Chevr.; *S. borealis* (Sars); *S. wolterecki*, Wagl.; *Vibilia cultripes*, Voss; *Phronima sedentaria* (Forsk.).

St. 257. 24. vi. 27. 35° 01′ S, 10° 18′ E. **TYF.** 250 (–0) m., night: *Stenopleura atlantica*, Stebb.; *Primno macropa*, Guér.; *Anchylomera blossevillei*, M. Edw.; *Brachyscelus crusculum*, Bate.

St. 259. 26. vi. 27. 34° 59′ S, 16° 39′ E. **TYF.** 170–250 (–0) m., night: *Scina crassicornis* (Fabr.); *Paraphronima crassipes*, Claus.

St. 266. 21. vii. 27. 29° 34′ S, 14° 24′ E. **TYF.** 200 (–0) m., night: *Stenopleura atlantica*, Stebb.; *Scina oedicarpus*, Stebb.; *Paraphronima gracilis*, Claus; *Phronima pacifica*, Streets; *Phrosina semilunata*, Risso; *Primno macropa*, Guér.; *Eupronoë minuta*, Claus; *Streetsia challengeri*, Stebb.

St. 267. 23. vii. 27. 24° 31′ S, 12° 15′ E. **TYF.** 450–550 (–0) m., night: *Cyphocaris challengeri*, Stebb.; *Scina curvidactyla*, Chevr.; *Brachyscelus crusculum*, Bate. **N 100 B.** 117–0 m., night: *Scina curvidactyla*, Chevr.; *Phrosina semilunata*, Risso.

St. 268. 25. vii. 27. 18° 37′ S, 10° 46′ E. **TYF.** 100–150 (–0) m., night: *Scina crassicornis* (Fabr.); *Vibilia viatrix*, Bov.; *Vibilia* sp.; *Oxycephalus clausi*, Bov.; *Platyscelus ovoides* (Claus); *P. armatus* (Claus); *P. serratulus*, Stebb. **N 100 B.** 73–0 m., night: *Vibilia armata*, Bov.; *V. cultripes*, Voss; *Paraphronima crassipes*, Claus; *Phronima sedentaria* (Forsk.); *Oxycephalus clausi*, Bov.

St. 270. 27. vii. 27. 13° 58′ S, 11° 43′ E. **N 100 B.** 126–0 m., night: *Scina curvidactyla*, Chevr. **TYF.** 200 (–0) m., night: *Scina curvidactyla*, Chevr.; *Vibilia viatrix*, Bov.; *Oxycephalus piscator*, M. Edw.

St. 273. 31. vii. 27. 9° 38′ S, 12° 42′ E. **TYF.** 200–230 (–0) m., night: *Cacao lacteus*, Brnrd.; *Scina crassicornis* (Fabr.); *Paraphronima crassipes*, Claus; *Phronima sedentaria* (Forsk.); *Phrosina semilunata*, Risso; *Brachyscelus crusculum*, Bate; *B. globiceps* (Claus); *Streetsia challengeri*, Stebb.

St. 276. 5. viii. 27. 5° 54′ S, 11° 19′ E. **N 100 B.** 110–0 m., night: *Scina crassicornis* (Fabr.). **TYF.** 150 (–0) m., night: *Scina curvidactyla*, Chevr.; *Cystisoma fabricii*, Stebb.; *Pronoë capito*, Guér.; *Parapronoë crustulum*, Claus; *Brachyscelus crusculum*, Bate; *Platyscelus inermis* (Claus).

St. 281. 12. vii. 27. 00° 46′ S, 5° 49′ E. **TYF.** 850–950 (–0) m., day: *Cyphocaris anonyx*, Boeck; *Metacyphocaris helgae*, Tatt.; *Lanceola pacifica*, Stebb.; *Scypholanceola vanhoeffeni*, Wolt.; *Scina crassicornis* (Fabr.); *S. curvidactyla*, Chevr.; *S. borealis* (Sars); *Vibilia cultripes*, Voss; *Cystisoma pellucidum* (W. Suhm); *C. fabricii*, Stebb.; *Phronima sedentaria* (Forsk.); *Thamneus platyrhynchus*, Stebb.; *Oxycephalus piscator*, M. Edw.; *Streetsia challengeri*, Stebb.

St. 282. 12. viii. 27. 1° 11′ S, 5° 38′ E. **TYF.** 300 (–0) m., night: *Rhabdosoma whitei*, Bate.

St. 283. 14. viii. 27. Off Annobon, Gulf of Guinea. **DLH.** 77 m., day: *Phrosina semilunata*, Risso.

St. 284. 15. viii. 27. 2° 13′ S, 1° 52′ E. **N 100 B.** 71–0 m., night: *Lanceola sayana*, Bov.; *Phrosina semilunata*, Risso; *Oxycephalus clausi*, Bov.

St. 285. 16. viii. 27. 2° 43′ S, 00° 56′ W. **N 450.** 125–175 (–0) m., night: *Cyphocaris faurei*, Brnrd.; *Lanceola sayana*, Bov.; *Scina crassicornis* (Fabr.); *Vibilia cultripes*, Voss; *Phronima sedentaria* (Forsk.); *P. curvipes*, Voss; *Phrosina semilunata*, Risso; *Parapronoë crustulum*, Claus; *Oxycephalus clausi*, Bov.; *Streetsia challengeri*, Stebb.; *Rhabdosoma whitei*, Bate; *Platyscelus ovoides* (Claus); *P. armatus* (Claus).

St. 286. 17. viii. 27. 3° 06′ S, 3° 53′ W. **N 70 B.** 102–0 m., night: *Lanceola sayana*, Bov. **TYF.** 125 (–0) m., night: *Lanceola sayana*, Bov.; *Scina crassicornis* (Fabr.); *Phrosina semilunata*, Risso;

Parapronoë crustulum, Claus; *Sympronoë parva* (Claus); *Lycaea nasuta*, Claus; *Brachyscelus crusculum*, Bate; *Oxycephalus clausi*, Bov.; *Streetsia steenstrupi*, Bov.

St. 287. 19. viii. 27. 2° 49′ S, 9° 25′ W. **TYF.** 800–1000 (–0) m., night: *Cyphocaris anonyx*, Boeck; *Metacyphocaris helgae*, Tatt.; *Parandania boecki* (Stebb.); *Mimonecteola macronyx*, n.sp.; *Lanceola pacifica*, Stebb.; *Scypholanceola vanhoeffeni*, Wolt.; *Parascina chevreusi*, Pirl.; *Cystisoma fabricii*, Stebb.; *Phronima pacifica*, Streets; *Phrosina semilunata*, Risso; *Oxycephalus clausi*, Bov.; *Rhabdosoma whitei*, Bate. **N 100 B.** 124–0 m., night: *Scina crassicornis* (Fabr.); *Paraphronima crassipes*, Claus; *Parapronoë crustulum*, Claus; *Oxycephalus clausi*, Bov.

St. 288. 21. viii. 27. 00° 56′ S, 14° 08′ W. **TYF.** 250 (–0) m., night: *Cyphocaris faurei*, Brnrd.; *Katius obesus*, Chevr.; *Lanceola sayana*, Bov.; *Parascina chevreusi*, Pirl.; *Pronoë capito*, Guér.; *Streetsia challengeri*, Stebb.; *Rhabdosoma whitei*, Bate; *R. armatum* (M. Edw.); *Platyscelus ovoides* (Claus). **N 100 B.** 73–0 m., night: *Scina crassicornis* (Fabr.); *Phronima curvipes*, Voss; *Oxycephalus clausi*, Bov.; *Rhabdosoma whitei*, Bate; *R. armatum* (M. Edw.).

St. 289. 23–24. viii. 27. 3° 04′ N, 16° 52′ W. **TYF.** 125–225 (–0) m., night: *Rhabdosoma whitei*, Bate.

St. 290. 24. viii. 27. 3° 25′ N, 16° 50′ W. **TYF.** 100 (–0) m., day: *Scina marginata*, Bov.; *Phronima colletti*, Bov.; *Parapronoë crustulum*, Claus; *Oxycephalus clausi*, Bov.; *Streetsia porcellus* (Claus); *Rhabdosoma whitei*, Bate.

St. 292. 24. viii. 27. 4° 03′ N, 16° 51′ W. **TYF.** 100–180 (–0) m., day: *Rhabdosoma whitei*, Bate.

St. 294. 25. viii. 27. 4° 33′ N, 16° 52′ W. **N 70 B.** 101–0 m., night: *Lanceola sayana*, Bov. **TYF.** 100–150 (–0) m., night: *Pronoë capito*, Guér.; *Oxycephalus clausi*, Bov.; *Rhabdosoma whitei*, Bate; *Platyscelus ovoides* (Claus).

St. 295. 25. viii. 27. 5° 30′ N, 17° 45′ W. **TYF.** 2500–2700 (–0) m., day: *Cyphocaris anonyx*, Boeck; *Scina rattrayi*, Stebb.; *Cystisoma pellucidum* (W. Suhm); *Pronoë capito*, Guér.; *Streetsia challengeri*, Stebb.

St. 296. 26. viii. 27. 8° 12′ N, 18° 49′ W. **TYF.** 450–500 (–0) m., night: *Cyphocaris faurei*, Brnrd.; *Metacyphocaris helgae*, Tatt.; *Scina crassicornis* (Fabr.); *Paraphronima crassipes*, Claus; *Phronima curvipes*, Voss; *Phronimella elongata* (Claus); *Pronoë capito*, Guér.; *Parapronoë clausoides*, Stebb.; *Brachyscelus crusculum*, Bate; *Oxycephalus clausi*, Bov.; *Streetsia challengeri*, Stebb.; *Leptocotis tenuirostris* (Claus); *Rhabdosoma whitei*, Bate.

St. 297. 28. viii. 27. 12° 08′ N, 20° 53′ W. **TYF.** 200–300 (–0) m., night: *Cystisoma fabricii*, Stebb.; *Phronima sedentaria* (Forsk.); *Phrosina semilunata*, Risso; *Primno macropa*, Guér.; *Rhabdosoma whitei*, Bate; *Platyscelus inermis* (Claus). **N 100 B.** 163–0 m., night: *Eupronoë maculata*, Claus; *Rhabdosoma whitei*, Bate.

St. 298. 29. viii. 27. 13° 01′ N, 21° 34′ W. **TYF.** 900–1200 (–0) m., day: *Lanceola aestiva*, Stebb.; *Vibilia cultripes*, Voss; *Hyperia spinigera*, Bov.; *Platyscelus ovoides* (Claus).

R.R.S. 'WILLIAM SCORESBY'

12. ix. 26. Walvis Bay, South-west Africa. **LH.** 4·57 m., from stomach of *Trigla capensis*: *Ampelisca palmata*, Brnrd.; *Melita subchelata*, Schell.; *Lembos hypacanthus*, Brnrd.

5. x. 26. Hoetjes Bay, Saldanha Bay, South Africa. **LH.** 8 m., from stomach of *Trigla capensis*: *Liljeborgia epistomata*, n.sp. **NH.** 0 m., from Medusae: *Hoplopleon medusarum*, n.sp.; *Hyperia galba*, Mont.

St. WS 25. 17. xii. 26. Undine Harbour, South Georgia. **BTS.** 18–27 m., m. s.: *Paralysianopsis odhneri*, Schell.; *Tryphosa triangularis*, n.sp.; *T. analogica*, n.sp.; *Orchomenella acanthurus* (Schell.); *Heterophoxus videns*, Brnrd.; *Parharpinia rotundifrons*, n.sp.; *Oediceroides calmani*, Wlkr.; *Oradarea tridentata*, n.sp.; *Eusiroides georgianus*, n.sp.; *Pontogeneiella longicornis* (Chevr.); *Djerboa furcipes*, Chevr.; *Schraderia gracilis*, Pfr.; *Haplocheira barbimanus* (Thoms.).

St. WS 27. 19. xii. 26. 53° 55′ S, 38° 01′ W. **N 100 H.** 107 m. (bottom 80 m., g.): *Acidostomella cultrifera*, Schell.; *Leucothoë spinicarpa* (Abildg.); *Colomastix fissilingua*, Schell.; *Polycheria antarctica* (Stebb.).

St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W. **N 100 H.** 130 m. (bottom 135 m., gy.m. st.): *Acidostomella cultrifera*, Schell.; *Lepidepecreella ovalis*, n.sp.; *Lepidepecreoides xenopus*, Brnrd.; *Orchomenella acanthurus* (Schell.); *Haploöps securiger*, Brnrd.; *Acanthonotozomella oatesi*, Brnrd.; *Gnathiphimedia mandibularis*, Brnrd.; *Oediceroides calmani*, Wlkr.; *Methalimedon nordenskjöldi*, Schell.; *Tiron antarcticus*, n.sp.; *Epimeria excisipes*, n.sp.; *E. puncticulata*, Brnrd.; *Haplocheira barbimanus* (Thoms.); *Caprellinoides mayeri* (Pfr.).

St. WS 38. 22–23. xii. 26. 54° 01′ S, 35° 14′ W. **N 100 H.** 53 m., night: *Orchomenella rossi* (Wlkr.). **N 100 H.** 0–5 m., night: *Vibilia antarctica*, Stebb.; *Cyllopus magellanicus*, Dana; *Parathemisto gaudichaudii* (Guér.).

St. WS 53. 11–12. i. 27. From 53° 42′ S, 37° 12′ W to 53° 29′ S, 37° 13′ W. **N 100 H.** 0–5 m., night: *Uristes gigas*, Dana; *Phoxocephalus coxalis*, n.sp.

St. WS 56. 14. i. 27. Larsen Harbour, Drygalski Fjord, South Georgia. **NH.** 2 m., kelp roots: *Bovallia gigantea*, Pfr.; *Pontogeneiella brevicornis* (Chevr.); *Schraderia gracilis*, Pfr.

St. WS 62. 19. i. 27. Wilson Harbour, South Georgia. **BTS.** 26–83 m.: *Paraperioculodes brevimanus*, Brnrd.; *Monoculodes scabriculosus*, n.sp.; *Djerboa furcipes*, Chevr.

St. WS 69. 22. ii. 27. 52° 19′ S, 52° 11′ W. **N 70 H.** 0–5 m., night: *Parathemisto gaudichaudii* (Guér.).

St. WS 71. 23. ii. 27. 6 miles N 60° E of Cape Pembroke, East Falkland Island. **OTC.** 82 m., s.: *Amaryllis macrophthalma*, Hasw.; *Tryphosites chevreuxi*, Stebb.; *Haplocheira robusta*, n.sp.

St. WS 72. 5. iii. 27. 50° 07′ S, 57° 34′ W. **OTC** and **N 4–T.** 95 m., s. sh.: *Chosroës incisus*, Stebb.; *Parathemisto gaudichaudii* (Guér.).

St. WS 76. 11. iii. 27. 51° 00′ S, 62° 02′ W. **DC.** 207 m., f.d.s.: *Urothoë falcata*, Schell.

St. WS 79. 13. iii. 27. 51° 01′ S, 64° 59′ W. **N 7–T.** 132–131 m., f.d.s., night: *Atyloella dentata*, n.sp.

St. WS 81. 19. iii. 27. 8 miles N 11° W of North Island, West Falkland Island. **N 7–T.** 81–82 m., s.: *Epimeria fasciata*, n.sp.

St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Island, East Falkland Island. **OTC.** 79 m., s. sh.: *Amaryllis macrophthalma*, Hasw.; *Lysianassa falklandica*, n.sp.; *Iphimediella nodosa* (Dana); *Epimeria fasciata*, n.sp.; *Haplocheira robusta*, n.sp.

St. WS 86. 3. iv. 27. 53° 53′ S, 60° 34′ W. **OTC.** 151–147 m., s. sh. st.: *Epimeria fasciata*, n.sp.; *Haplocheira robusta*, n.sp.

St. WS 88. 6. iv. 27. 54° 00′ S, 64° 57′ W. **OTC.** 118 m., s. sh. st.: *Ampelisca statenensis*, n.sp.; *Parharpinia sinuata*, n.sp.; *Eusirus antarcticus* (Thoms.).

St. WS 89[1]. 7. iv. 27. 9 miles N 21° E of Arenas Point Light, Tierra del Fuego. **N 4–T.** 23–21 m., m. g. st.: *Nototropis villosus* (Bate); *Parathemisto gaudichaudii* (Guér.).

St. WS 92. 8. iv. 27. 51° 58′ S, 65° 01′ W. **N 7–T.** 145–143 m., f.d.s. st.: *Tryphosites chevreuxi*, Stebb.; *Chosroës incisus*, Stebb.

St. WS 95. 17. iv. 27. 48° 58′ S, 64° 45′ W. **TYF.** 30 (–0) m., day: *Cyllopus magellanicus*, Dana; *Hyperia galba*, Mont.; *Parathemisto gaudichaudii* (Guér.); *Phronima sedentaria* (Forsk.).

St. WS 96. 17. iv. 27. 48° 00′ S, 64° 58′ W. **OTC.** 96 m., f.d.s.: *Phoxocephalopsis zimmeri*, Schell.

St. WS 97. 18. iv. 27. 49° 00′ S, 61° 58′ W. **OTC.** 146–145 m., s. g. st.: *Lysianassa falklandica*, n.sp.

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[1] Wrongly plotted in *Discovery Reports*, vol. I, Station List, pl. IV.

St. WS 99. 19. iv. 27. 49° 42′ S, 59° 14′ W. **OTC.** 251–225 m., f.d.s., dawn, from stomach of *Merluccius*: *Parathemisto gaudichaudii* (Guér.).

St. WS 105. 24. iv. 27. 48° 50′ S, 64° 24′ W. **N 100 H.** 101 m., day: *Phronima sedentaria* (Forsk.).

St. WS 123. 8–9. vi. 27. Gough Island. Shore collecting: *Paramoera tristanensis*, n.sp.; *Allorchestes* sp.

MARINE BIOLOGICAL STATION

St. MS 2. 11. ii. 25. 2½ cables E of Hope Point, East Cumberland Bay, South Georgia. **NC 50 H.** 15 m., day: *Hyperiella antarctica*, Bov.

St. MS 6. 12. ii. 25. East Cumberland Bay, South Georgia. **BTS.** 24–30 m.: *Oradarea tridentata*, n.sp.; *Schraderia gracilis*, Pfr.

St. MS 10. 14. ii. 25. East Cumberland Bay, South Georgia. **BTS.** 26–18 m.: *Bovallia gigantea*, Pfr.; *Pontogeneiella longicornis* (Chevr.); *Djerboa furcipes*, Chevr.; *Schraderia gracilis*, Pfr.; *Parajassa georgiana*, Schell.

St. MS 14. 17. ii. 25. Off Sappho Point, East Cumberland Bay, South Georgia. **DS.** 190–110 m.: *Caprellinoides tristanensis*, Stebb.

St. MS 22. 9. iv. 25. 1·3 miles N of Dartmouth Point, East Cumberland Bay, South Georgia. **NC 50 V.** 40–0 m.: *Pagetina genarum*, Brnrd.; *Hyperiella antarctica*, Bov.

St. MS 25. 13. iv. 25. East Cumberland Bay, South Georgia. **BTS.** 36 m.: *Eusiroides georgianus*, n.sp. **NC 50 H.** 10 m., day: *Hyperiella antarctica*, Bov.

St. MS 26. 15. iv. 25. East Cumberland Bay, South Georgia. **NC 50 H.** 10 m., day: *Hyperiella antarctica*, Bov.

St. MS 30. 30. iv. 25. East Cumberland Bay, South Georgia. **NC 50 V.** 40–0 m., day: *Vibilia antarctica*, Stebb.; *Hyperoche medusarum* (Kröy.).

St. MS 32. 1. v. 25. East Cumberland Bay, South Georgia. **BTS.** 40 m.: *Djerboa furcipes*, Chevr. **NC 50 H.** 0–5 m., day: *Primno macropa*, Guér.

St. MS 36 B. 14. x. 25. King Haakon Bay, South Georgia. **NHS.** 0 m., day: *Parathemisto gaudichaudii* (Guér.).

St. MS 39. 25. x. 25. King Haakon Bay, South Georgia, to 3 miles S of Undine Harbour. **NHS.** 0 m., day: *Parathemisto gaudichaudii* (Guér.).

St. MS 40. 25. x. 25. ¾ mile S of Cape Pariadin to 5 miles W of Welcome Island, South Georgia. **NHS.** 0 m., night: *Hyperiella antarctica*, Bov.

St. MS 62. 24. ii. 26. East Cumberland Bay, South Georgia. **BTS.** 31–40 m. *Orchomenella acanthurus* (Schell.).

St. MS 63. 24. ii. 26. East Cumberland Bay, South Georgia. **BTS.** 23 m.: *Parepimeria crenulata*, Chevr.; *Paradexamine fissicauda*, Chevr.

St. MS 64. 24. ii. 26. 1·8 miles SE by S of King Edward Point Light, East Cumberland Bay, South Georgia. **DS.** 7–15 m.: *Polycheria antarctica* (Stebb.).

St. MS 65. 28. ii. 26. East Cumberland Bay, South Georgia. **BTS** and **NCS–T.** 39 m.: *Cardenio paurodactylus*, Stebb.; *Djerboa furcipes*, Chevr.; *Paradexamine fissicauda*, Chevr.

St. MS 66. 28. ii. 26. East Cumberland Bay, South Georgia. **NCS–T.** 18 m.: *Monoculodes scabriculosus*, n.sp.; *Oediceroides calmani*, Wlkr.; *Paradexamine fissicauda*, Chevr.

St. MS 67. 28. ii. 26. East Cumberland Bay, South Georgia. **BTS.** 38 m.: *Cheirimedon femoratus* (Pfr.); *Gitanopsis antarctica*, Chevr.; *Metopoides parallelocheir* (Stebb.); *Thaumatelson nasutum*, Chevr.; *T. cultricauda*, n.sp.; *Monoculodes scabriculosus*, n.sp.; *Oediceroides calmani*, Wlkr.; *Oradarea bidentata*, n.sp.; *Pontogeneiella longicornis* (Chevr.); *Prostebbingia gracilis* (Chevr.); *Djerboa furcipes*, Chevr.; *Schraderia gracilis*, Pfr.

St. MS 68. 2. iii. 26. East Cumberland Bay, South Georgia. [**N** 200. 200–0 m. *sic* on label.] *Orchomenella rossi* (Wlkr.). **NRL** and **NCS.** 220–247 m.: *Orchomenella macronyx*, Chevr.; *Paraperioculodes brevimanus*, Brnrd.; *Oradarea tridentata*, n.sp.

St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia. **BTS** and **NCS–T.** 110–60 m.: *Aristias antarcticus*, Wlkr.; *Leucothoë spinicarpa* (Abildg.); *Iphimediella margueritei*, Chevr.; *Gnathiphimedia mandibularis*, Brnrd.; *Echiniphimedia hodgsoni* (Wlkr.); *Halice profundi*, n.sp.; *Monoculodes scabriculosus*, n.sp.; *Oediceroides calmani*, Wlkr.; *Oradarea bidentata*, n.sp.; *Epimeria puncticulata*, Brnrd.; *Parepimeria crenulata*, Chevr.; *Eusiroides georgianus*, n.sp.; *Prostebbingia gracilis* (Chevr.); *Djerboa furcipes*, Chevr.; *Polycheria antarctica* (Stebb.); *Cerapus oppositus*, n.sp.

St. MS 74. 17. iii. 26. East Cumberland Bay, South Georgia. **NCS** and **BTS.** 22–40 m.: *Thaumatelson nasutum*, Chevr.; *Monoculodes scabriculosus*, n.sp.; *Oradarea tridentata*, n.sp.; *O. bidentata*, n.sp.; *Prostebbingia gracilis* (Chevr.); *Djerboa furcipes*, Chevr.; *Paradexamine fissicauda*, Chevr.

St. MS 82. 6. ix. 26. Off Salamander Point, Saldanha Bay, South Africa. **BTS.** 4 fms. (7–14 m.): *Iphimedia capicola*, n.sp.; *Panoploea excisa*, n.sp.; *Paramoera capensis* (Dana).

Examples of Cyamidae were collected at South Georgia, South Shetlands, Saldanha Bay, Durban, and at 14° 45′ N, 18° 24′ W.

GENERAL REMARKS AND OBSERVATIONS

CLASSIFICATION

It is not always easy to steer a middle course between "lumping" and "splitting". In many modern works a noticeable tendency towards the latter is present, and there is much to be said in its favour. In cases where abundant material in all stages of growth can be obtained from well-explored areas like the European seas, it is often possible to establish an acceptable synonymy. But in a vast region like the southern hemisphere, where extremely little detailed exploration has been carried out, and we are only just starting to acquire a knowledge of the fauna, much greater caution is necessary. As a result of the study of the Discovery collection, it has been borne in upon me, to my great regret, that much of the work of the late Dr Chilton was marred by too premature an insistence on the "variability" and "wide distribution" of certain species in the Antarctic and sub-Antarctic seas.

Variation should not be invoked to account for slight differences between forms from different regions. It should be determined on a large number of individuals from one locality or contiguous areas (e.g. *Echiniphimedia echinata*). And when determined in one form it should not be attributed by analogy, or only with the greatest caution, to another allied species or, *a fortiori*, genus.

The recognition of this principle and the desire to avoid an increase in the number of "species" seem to be responsible for the tendency to adopt a trinomial nomenclature. It is questionable whether it is not more convenient, as often as not, to regard every form or variety, unless connected with the typical form by full series of gradations, as a species.

For example, the common Lysianassid *Orchomenella chilensis* occurs in several forms (cf. Schellenberg, 1926) in Antarctic and sub-Antarctic waters. It also occurs in South Africa in a form (f. *plicata*) so distinct that one may well consider it as a species; as a species, moreover, which does not occur elsewhere so far as we yet know. But the trinomial system of recording is certainly far better and more accurate than the statement that *O. chilensis* is a variable and widely distributed species. Such a statement would entirely conceal and confuse the facts of geographical distributions.

A further example of confusion caused by "lumping" is the *Nannonyx kidderi* "complex", which may be said to have been imposed, and to have imposed, upon all authors since 1909.

A very great deal of work has yet to be done on the southern fauna before the classification rests on as firm a footing as does that of the northern fauna; and many points in the latter are still not settled. In the meantime it seems wiser to err on the side of "splitting".

HISTORICAL

It may be of interest to give a brief outline of the growth of our knowledge of the Amphipodan fauna of the area primarily investigated by the 'Discovery', i.e. the South American quadrant; for this purpose the Chilean and Patagonian coast north of 47° S lat., and also Tristan da Cunha, will be excluded.

It is rather surprising that the first Amphipod to be described from this region, in fact from the Antarctic, should be a pelagic form and not a littoral form, even though it is the commonest pelagic form there. In 1825 Guérin described *Themisto gaudichaudii*, collected near the Malouines (Falkland Islands) by Gaudichaud, who was botanist on the 'Uranie'.

Gaudichaud also collected an *Anchylomera* (*abbreviata* = *blossevillei* M. Edw.) and a *Phlias* (*serratus*) in the course of a voyage between the Malouines and Port Jackson. These were described by Guérin in 1836. It is probable that both these species were collected in the Southern Pacific. *Anchylomera* has not been found in the area under discussion; and *Phlias* has not since been rediscovered, though Stebbing (1899, *Trans. Linn. Soc. Lond.*, p. 417) reported a specimen from the Mediterranean which agreed with the generic characters of *Phlias*. Both these species, therefore, are here ignored.

To the enterprise of the early French whalers we owe the important paper by Rousell de Vauzème on *Cyamus* in 1834, in which are described the three species of whale louse, *ovalis*, *erraticus*, and *gracilis*, based on specimens collected from "whales harpooned under his own eyes" in the neighbourhood of Tristan da Cunha and the Falklands (see Stebbing, 1888, p. 155).

In 1848 Milne-Edwards described the huge Amphipod *Lysianassa magellanica*, collected by D'Orbigny from the stomach of a fish caught off Cape Horn. This species has not been rediscovered in the south, though it has been identified with the Arctic

Eurythenes gryllus. I am by no means prepared to accept this identification, as from our present knowledge of the Arctic and Antarctic faunas it seems far more likely that *magellanica* will prove to be a valid species (see *infra*, p. 58).

Meanwhile the U.S. Exploring Expedition had traversed our area, and the following Amphipoda, with their equivalent modern names, were described in Dana's classic work (1852, 1853 and 1855):

Stenia magellanica	Tierra del Fuego	United, and considered *species dubiae* (Stebbing, 1906)
Anonyx fuegiensis	,,	
Uristes gigas	Antarctic, stomach of fish	*Uristes g.*
Iphimedia nodosa	Hermite Island	*Iphimediella n.*
Atylus simplex	,,	*Pontogeneia s.*
Gammarus fuegiensis	"Feejee Islands"	*Lembos f.* (see Stebbing, 1914)
Orchestia scutigerula	Tierra del Fuego	*Talorchestia s.*
,, *nitida*	,,	*Orchestia n.*
Amphithoe brevipes	Hermite Island	*Ampithoe b.*
Cyllopus magellanicus	Tierra del Fuego	*Cyllopus m.*
Themisto antarctica		*Parathemisto gaudichaudii*
Hyperia trigona	"Lagulhas Bank near Cape Horn"[1]	Probably a young *P. gaudichaudii*

We may thus reckon that eight definite and recognized species were added to the fauna list. No further additions were made until Bate visited the Paris Museum and described in his British Museum Catalogue of Amphipoda (1862) some specimens derived from the collections made during the voyage of 'La Zélée' (1837–40). These were:

Orchestia fuegensis	Port Famine	= *O. nitida*, Dana
Cyllopus danae	Near Powel Island (South Orkneys)	= *C. magellanicus*, Dana
Cyllopus lucasii	,, ,, ,,	= *C. lucasii*
Vibilia edwardsii	,, ,, ,,	= *V. edwardsii* (see p. 264)

He also recorded from the same expedition *Themisto antarcticus*, Dana, from 62° 25′ S, 58° W.

In the same work Bate described two species collected at Hermite Island by the British Expedition of the 'Erebus' and 'Terror' under Sir James Clarke Ross (1839–43) (referred to by Bate as the "Antarctic Expedition"), viz.:

Atylus huxleyanus = *Halirages h.*
,, *villosus* = *Nototropis v.*

The latter has remained obscure until rediscovered by the 'Discovery.

Although not collected within our area, mention may here be made of *Anonyx* (= *Orchomenella*) *chilensis* described by Heller in 1868 from the collections of the 'Novara'. This is a polymorphic species which is considered (Schellenberg, 1926) to include several forms which do occur in our area.

In 1871 Cunningham gave an account of some Amphipods collected by him during the cruise of H.M.S. 'Nassau' in the years 1866–9. Brief and unsatisfactory descriptions were given of the following:

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[1] Stebbing (1910 *a*, p. 476) included this in the South African fauna, suggesting that Dana meant to write "Cape of Good Hope". Bate records it from the "Antarctic Expedition".

Allorchestes patagonicus, of which *Hyalella patagonica* Ortm. 1911 may be a synonym.
Atylus batei, which Stebbing (1888, p. 405) held to be synonymous with *huxleyanus*. Although Cunningham recorded also the latter species, I incline to Stebbing's view.
Iphimedia normani, a species which Stebbing rediscovered in a collection from the Falkland Islands and referred to the genus *Pariphimedia*.

In 1887 Bovallius described *Tyro* (= *Scina*) *tullbergi* from off Cape Horn. There is no further record of a *Scina* from this area, nor has the 'Discovery' taken any.

Next came the important paper by Pfeffer (1888) on the Amphipods collected by the German Transit of Venus Expedition at South Georgia in the years 1882–3. Up to this time South Georgia was *terra incognita* so far as concerned Amphipoda. Pfeffer described 13 species, all of which he considered as new to science. Chilton in 1913 re-examined the types and came to the conclusion that six of the species were synonymous with previously described species.

From the study of the present collection I am venturing to disagree with Chilton in regard to some of these synonyms. In my opinion ten of Pfeffer's species are to be maintained as valid, viz.:

Orchomenella zschauii
Cheirimedon femoratus
Metopoides sarsii
Bovallia gigantea
Eurymera monticulosa
Paramoera gregaria
Schraderia gracilis
Pontogeneia georgiana
Paraceradocus miersii
Caprellinoides mayeri

In the same year (1888), but later than Pfeffer's paper, appeared Stebbing's Challenger Report, the most wonderful work yet published on the Amphipoda. That the 'Challenger' added comparatively few species to the fauna list of our area is due to her having passed but once through Magellan Strait (January 1876) and captured specimens of Amphipods at only three stations. One of these (St. 313), however, provided nine new species. The additions to the fauna list were as follows:

Acontiostoma magellanica
Amaryllis macrophthalma Hasw.
Metopella ovata
Metopoides magellanicus
M. parallelocheir
M. compactus
Proboloides crenatipalmata
Seba saundersii Stebb.
Chosroes incisus
Atylopsis dentata
Atyloella magellanica
Hyperia gaudichaudii = *galba*

A month after the 'Challenger,' the 'Gazelle' also passed through Magellan Strait, and at St. 47–53 a few Amphipods were collected, which, however, were not identified or reported upon (see Studer, *Forschungsreise 'Gazelle'*, III, pp. 279 *sqq.*, 1889).

To bridge the gap between the Challenger Report and that of the First French Antarctic Expedition, we find that Mayer has recorded (in 1890) *Caprella equilibra* and (in 1903) *C. acutifrons* and *ungulina*, and *Piperella grata*. The latter, derived apparently from the same collection whence Pfeffer had already described *Caprellinoides mayeri*, is in my opinion only the young of *C. mayeri*.

Our first insight into the richness of the fauna of the more southerly portions of the area in question was provided by the results of the First French Antarctic Expedition, 'Le Français' (1903–5). Chevreux in his report (1906) recorded nine species already known and 15 new species. Allowing for probable synonymy, I think that 17 of these two dozen species can be admitted as additions to the fauna list.

In 1911 Chevreux was able to record two species from the South Sandwich Group, an area which it is seldom possible to visit on account of the pack ice. These two are, in my opinion, synonymous with previously described species and are not reckoned here.

Ortmann (Princeton University Expedition to Patagonia) in 1911 described *Hyalella patagonia*, which may be the same as Cunningham's *Allorchestes patagonicus*.

Chevreux's preliminary diagnoses of some of the Amphipods of the Second French Antarctic Expedition, the 'Pourquoi Pas?' (1908–10), and also Chilton's account of the Amphipods of the Scottish National Antarctic Expedition, 'Scotia', appeared in 1912. Chevreux's full account appeared the following year. These two expeditions added about 24 ('Pourquoi Pas?') and 11 ('Scotia') species to the fauna list.

The collections of Mr Rupert Vallentin at the Falkland Islands enabled Stebbing (1914) to add ten more species, four of which were new.

In 1914 also a pelagic Amphipod originally described from another sector of the Antarctic (*Tauria macrocephala*, Dana) was recorded by Shoemaker from South Georgia.

Finally Monod in his report (1926) on the "Belgica" Amphipods recorded five species from the Magellan Strait area, and seven from about 87° W long. Some of the specimens, being juveniles, were not referred to definite species.

Reckoning these doubtful species, approximately 120 species were thus known when the Discovery Investigations were beginning.[1]

The first two years' cruising of the 'Discovery' and the 'William Scoresby' has resulted in doubling the number of species on the fauna list. Approximately 242 species are now known.

ARCTIC AND ANTARCTIC FAUNAS

One notable result of the Discovery Investigations has been the finding of further evidence of the similarity of the northern and southern faunas.

Chevreux (1913) noted 11 families of Gammaridea, and also the Caprellidae, as absent from Antarctic waters. Representatives of four of these families, and of the Caprellidae, were collected by the 'Gauss'. The 'Terra Nova' obtained a Lafystiid. Consequently there are only a few of the smaller families like the Stenothoidae, Cressidae, Anamixidae, Ingolfiellidae, Argissidae, etc., which are not yet known to be represented in the Antarctic fauna.

Though the 'Discovery' has not brought back representatives of any known family not previously recorded from Antarctic or sub-Antarctic waters, she has discovered representatives of a new family, Pagetinidae, and a new genus which may also require to be put in a family of its own. Moreover Bate's *Atylus villosus* has been rediscovered, so that the Atylidae are now known to be definitely present in the Antarctic.

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[1] Schellenberg's 1931 report on the Swedish Antarctic Expedition material not included.

In regard to genera the 'Discovery' has added the following to the Antarctic fauna list: *Byblis*, *Haploöps*, *Pardalisca*, *Nicippe*, *Halice*, *Tiron*, *Maera*, *Megamphopus*, *Podoceropsis*.

Evidence of the similarity of the northern and southern faunas is thus accumulating rapidly. Though it may still be correct to say that the southern area lacks certain families or genera, the balance may soon tilt the other way, and it will be the northern area which will be noted for its deficiencies. For the abundance and richness of the Antarctic fauna is being confirmed to an ever increasing degree by every successive expedition.

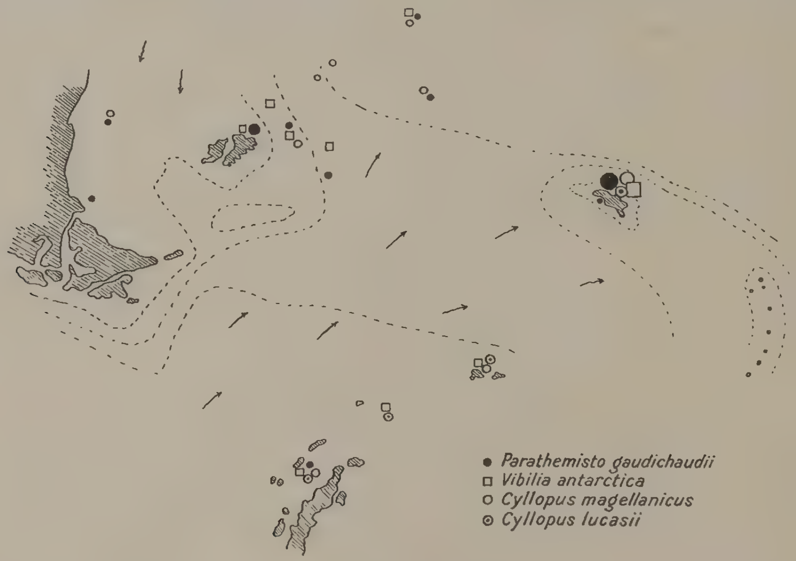

Fig. 1. Chart showing distribution of the four commonest pelagic Amphipods. The relative abundance is indicated approximately by the size of the signs. For details of the South Georgia area see Fig. 2. The South Orkney records are from Bate (1862). (Isobaths approximate only.)

As examples of the wealth of species in some localities, the lists of species at certain stations may be mentioned. Around South Georgia St. 42 and St. 140 both produced 25 species, St. 123 28 species, and St. 144 29 species. Off Clarence Island St. 170 produced 36 species. In Bransfield Strait St. 175 produced 33 species. These are all bottom dwellers, and were captured in a single haul at each station.

DISTRIBUTION

It would be premature to attempt a lengthy discussion of the geographical distribution of the components of the Amphipodan fauna of the area investigated, especially in view of the further investigations now being undertaken by the 'Discovery II'. It may not be amiss, however, to deal briefly and tentatively with some of the conclusions to which the results of the Discovery (1925–7) investigations seem to point.

The detailed oceanographical results have yet to be published, but it is sufficient for our purpose to note the main course of the currents and the bathymetrical features.

The cold west drift current passes through Drake Strait and across the Southern Atlantic. South Georgia lies athwart its course; a fact which has very important bearings on the distribution of whale food and whales (see Hardy, *Geogr. Journ.*, LXXII, Sept. 1928). The Falkland Islands lie on the northern flank of this current, and between them and the mainland of South America a warmer current flows southwards.

These two currents seem to have but little influence on the pelagic Amphipods. The three most abundant pelagic species in the Discovery collection are found in both currents (cf. chart, Fig. 1), though a fourth species, *Cyllopus lucasii*, appears to be confined to the colder waters.

Within the limits of the cold west drift current, the distribution of the pelagic Amphipods around South Georgia is noteworthy, especially as it coincides in a striking manner with the distribution of *Euphausia superba* (cf. Hardy, *loc. cit.* Figs. 4 and 5) and is evidently due to similar ecological factors.

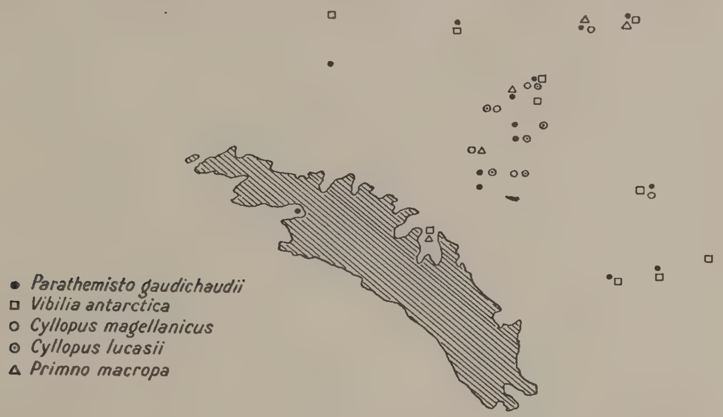

Fig. 2. Chart showing the stations around South Georgia at which the five commonest pelagic Amphipods were captured. (Cf. Hardy, *Geogr. Journ.*, LXXII, Sept., 1928, figs. 4, 5.)

With the exception of two captures of *Parathemisto gaudichaudii* by members of the Marine Station, not a single pelagic Amphipod was captured on the south-west side of South Georgia; whereas on the north-east side several species were found, some of them in great abundance (cf. chart, Fig. 2).

It is true that the two vessels of the expedition did more collecting on the north-east side (cf. *Discovery Reports*, I, Station list, pl. ii), but the 'William Scoresby' ran a line of stations (WS 40–52 and 63) on the south-west side with entirely negative results, so far as Amphipods are concerned.

The conclusion seems warranted that the causes which Hardy (*loc. cit.*) suggested are operative determining the distribution of *Euphausia*, are operative also in the case of the pelagic Amphipods. The same contrast in the relative abundance of Amphipods on the two sides of South Georgia is found also in the bottom fauna, though in a much less noticeable degree.

As regards the bottom fauna of the whole region under discussion, one outstanding feature becomes evident when we analyse its composition in the several areas.

The 100 fathom (183 m.) line unites the Falkland Islands with Tierra del Fuego and the mainland, and there is considerable similarity in their faunas. These two areas are separated, however, from the more southerly groups of islands by a considerable depth of water, in Drake Strait by a depth of over 2000 fathoms, and by the sudden hydrographic change known as the Antarctic Convergence. That a strong contrast should be found between the shallow-water faunas on opposite sides of this channel was not surprising. It was apparent to some extent from the results of previous explorations, but the Discovery Investigations have accentuated it very considerably.

As in the case of the boreal and austral faunas, so in a similar manner on a smaller scale the contrast is most marked in the species, less so in the genera, and still less so in the families; though even here there is a difference. So far as our present knowledge goes, the Atylidae and Aoridae are present in the Magellanic area (including under this term the Falkland Islands), but not in the more southerly groups of islands. On the other hand the latter area contains seven families which have no representatives in the Magellanic area; the most important of these families being the Pardaliscidae, Tironidae and Pleustidae.

As examples of genera, which are found in the Magellanic area but do not appear to extend farther south, may be mentioned *Amaryllis*, *Lysianassa*, *Tryphosites*, *Urothoë*, *Halirages*, *Nototropis*, *Lembos*, *Stenothoë*, *Amphithoë*, and *Melita*.

The following genera are common to both areas, but are represented by different species in the two areas:

Tryphosa castellata in Magellanic area opposed to *analogica*.
Seba saundersii ,, ,, ,, *antarctica* and other species.
Colomastix castellata ,, ,, ,, *fissilingua*.
Iphimediella nodosa ,, ,, ,, *margueritei* and others.
Pariphimedia normani ,, ,, ,, *integricauda*.
Panoploea macrocystidis ,, ,, ,, *joubini*.
Monoculodes vallentini ,, ,, ,, *antarcticus*.
Chosroës incisus ,, ,, ,, *decoratus*.
Epimeria acanthurus ,, ,, ,, *macrodonta* and other species.
Pontogeneia simplex ,, ,, ,, *antarctica*.
Paradexamine nanus ,, ,, ,, *fissicauda*.
Eurystheus eurypodii ,, ,, ,, *distichon* and others.
Haplocheira robusta ,, ,, ,, *barbimanus*.

As regards the Epimeriids the 'Terra Nova' record of *Epimeria inermis* from west of the Falkland Islands appears anomalous, but is not really so, as there is a tongue of deep water running northwards between the Falkland Islands and Tierra del Fuego.[1]

The 'Discovery' crossed this tongue of deep water recording depths of 578–675 m., but unfortunately secured no Amphipods (St. 227–230). Further investigation of this area might prove interesting.

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[1] Cf. chart in Pratje, Beitrag zur Bodengestaltung des Atlantischen Ozeans, *Centralbl. Min. Geol. Palaeont.*, Abt. B, No. 3, p. 129, fig. 2, 1928.

Among the species which inhabit both areas there are one or two interesting cases. Widely distributed species like *Leucothoë spinicarpa*, *Jassa falcata*, and *Polycheria antarctica* may be ignored; also *Eusirus antarcticus* and *Rhachotropis antarctica* which are probably more bathypelagic than true bottom dwellers.

In the same category is *Parharpinia sinuata*, which like most Phoxocephalids is probably pelagic at night or at certain seasons. Records of *Pachychelium* and the Metopids are to be used with caution, as these forms are often liable to be misidentified owing to the minuteness of the differential characters.

Of particular interest, however, is the occurrence of *Paramoera gregaria* and *Talorchestia scutigerula* at South Georgia as well as in the Tierra del Fuego area. The former is a littoral or shallow-water form, and might conceivably have migrated before Drake Strait became the wide and deep channel it now is. But the latter is a terrestrial form and not improbably dates back to a still earlier period when the Antarctic continent—or at least South Georgia—was connected with Tierra del Fuego (v. Gregory, The Geological History of the Atlantic Ocean, *Quart. Journ. Geogr. Soc.*, LXXXV, Pt. 2, p. cvii *sqq.* and maps, p. cxviii, 1929).

There is a strong resemblance between the faunas of the South Shetland Islands and Palmer Archipelago on the one hand, and the Ross Sea area on the other hand, as evidenced by the Acanthonotozomatids, Epimeriids and other forms.

BIOLOGICAL

With a view to gaining an insight into the mutual relationships of marine organisms, it may be of interest to collect together lists of those Amphipods which were found by the 'Discovery' in the stomachs of fishes, and those which were found commensal in sponges and Ascidians.

From stomach of "*Perca antarctica*", Blue Fish[1]: *Vibilia armata, Cyllopus magellanicus, Phronima sedentaria.*

From stomach of *Thynnus pelamys*: *Phronima sedentaria.*

From stomach of *Merluccius*: *Parathemisto gaudichaudii.*

From stomach of *Naucrates ductor*: *Platyscelus ovoides.*

From stomach of *Notothenia*: *Cheirimedon femoratus, Tryphosa kergueleni, Lepidepecreum cingulatum, Pontogeneiella brevicornis.*

From stomach of skate (*Psammobates*): *Phoxocephalopsis zimmeri.*

From stomach of *Trigla capensis*: *Ampelisca palmata, Liljeborgia epistomata, Melita subchelata, Lembos hypacanthus.*

On or in sponges: *Leucothoë spinicarpa, Seba antarctica, Colomastix castellata, Echiniphimedia hodgsoni, Echiniphimedia echinata, Chosroës incisus, Oradarea tridentata, Polycheria antarctica, Didymochelia spongicola.*

On *Cephalodiscus*: *Podocerus septemcarinatus.*

On the crab *Eurypodius*: *Eurystheus eurypodii.*

In branchial chamber of Ascidians: *Orchomenella macronyx, Proboloides porcellanus.*

In Medusae: *Hoplopleon medusarum, Hyperia galba.*

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[1] Probably = *Seriolella velaini*, Sauv., see Regan, *Ann. Mag. Nat. Hist.* (8), XI, p. 467, 1913.

SYSTEMATIC ACCOUNT

GAMMARIDEA

Family LYSIANASSIDAE

Stebbing, 1906, pp. 8 and 717–721.
Schellenberg, 1926, p. 239.
Barnard, 1930, p. 318.

Remarks. In dealing with several genera in this family the characters of the epistome plus upper lip, and the profile outline of pleon segment 4 have been regarded as of specific importance. Some other authors have assumed an extensive variability in these characters, without adducing definite proof of such variability in every case, and on this basis have attempted to lump many forms together under one name, whereby the "species" has acquired a "wide distribution". An outstanding example of this procedure is the sinking of the Australian *Tryphosa camelus*, Stebb. as a synonym of the Norwegian *T. sarsi* (cf. Chilton, 1921*a*, p. 43).

On the contrary I have found in examining the present collection very little evidence of variability. Enlarged drawings of the profiles of pleon segment 4 of several individuals, if superimposed, would naturally not coincide exactly; but the essential and characteristic curve of the profile is maintained. It is thus a good specific character.

One feature has not been taken into account in dealing with the more closely allied representatives of this family, viz. the surface sculpturing. The possible importance of this was not fully realized until the bulk of this report was completed and the Pontogeneiids were being studied (*infra*, p. 195). I may suggest, however, that the value of this character be investigated in, e.g., the genera *Orchomene*, *Orchomenella* and *Tryphosa*. The Cape form of *chilensis* (*plicata*) has the surface nitidulous with scattered pits, whereas *rossi* has a perfectly nitidulous surface without any pits.

Genus **Kerguelenia**, Stebb.

Stebbing, 1906, p. 11.
Schellenberg, 1926, p. 239.
Barnard, 1930, p. 318.

Kerguelenia palpalis, n.sp.

Schellenberg, 1926, p. 241, fig. 2. (*Kerguelenia* sp., juv.)

Occurrence: St. 175. South Shetlands. 1 (? ♂) 6 mm.[1]

Remarks. This specimen seems to belong to the same species as the young specimen mentioned by Schellenberg. It has the same stout palp on the maxilliped as figured by him, the biramous 3rd uropod, and the distally expanded and lobed 2nd joint of peraeopod 3. First antenna with 6-jointed flagellum, 4-jointed accessory flagellum. Second antenna with 6-jointed flagellum. Eyes as in *borealis*.

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[1] Except where otherwise stated, all measurements are taken from the point of the head or rostrum to the end of the telson.

From *borealis* it differs in the much stouter palp of the maxilliped, the slightly more broadly rounded postero-inferior angle of pleon segment 3, and the (vertical) depth of the excavation on side-plate 4 being equal to the (vertical) depth of the backward process (in *borealis*, Sars, 1895, pl. xl, fig. 2, the former is greater than the latter, if the figure is a true side view and the lower parts of the side-plates are not foreshortened).

DISTRIBUTION. 'Gauss' winter station, 385 m.

Genus **Shackletonia**, Brnrd.

Barnard, 1931, p. 425.

Body robust. Side plates deep, 1st deeper than 2nd and 3rd, 4th large, deeply excavated, 5th bilobed, posterior lobe deeper than anterior. Telson deeply cleft. Antennae (immature) short, 2nd and 3rd peduncular joints of 1st antenna very short, accessory flagellum nearly as long as flagellum. Mouth-parts rather prominent. Epistome evenly convex in front, passing into upper lip without any intervening notch or groove. Mandible elongate, cutting edge straight, molar slight, conical, palp inserted in middle of trunk just behind molar. Lobes of lower lip subacute. First maxilla slender, outer lobe with very oblique distal margin set with six strong recurved hooks, palp 2-jointed, distally narrowing to subacute apex. Second maxilla slender, inner lobe shorter than outer. Maxilliped with inner plate small, slender; outer plate large, margin entire and unarmed; palp moderate, 4-jointed. First gnathopod simple. Second gnathopod minutely chelate. Peraepods 3–5 with 2nd, 4th and 5th joints strongly expanded. Uropods 2 and 3 with peduncle stout. Accessory branchiae one on each of segments 2–5, two on segment 6.

REMARKS. This form has characters of both *Acidostoma* and *Phoxostoma*. The mouth-parts show the peculiar hook-like spines on the 1st maxilla only found elsewhere in *Acidostoma*, and which are possibly adaptations to a particular diet. On the other hand the palps of maxilla 1 and maxilliped show no degeneration. The development of the accessory branchiae is exactly like that of *Waldeckia obesa* and raises the question as to what systematic value these structures possess.

Named in commemoration of the exploits of the late Sir Ernest Shackleton in the Antarctic regions.

Shackletonia robusta, Brnrd. (Fig. 3).

Barnard, 1931, p. 425.

Occurrence: 1. St. 123. South Georgia. 1 juv. 12 mm.
2. St. 170. South Shetlands. 1 immat. 28 mm. *Type*.

DESCRIPTION. Body robust, tumid in middle as in *Waldeckia obesa*. Integument indurated, with scattered punctures extending over the peraeon, pleon, side-plates and 2nd joints of peraeopods 3–5.

Head with antero-lateral angle rounded. Eyes large, reniform, wider below than above, dark.

Side-plate 1 slightly deeper than 2 and 3, rounded below, not expanded forwards; 4 deep and strongly excavate, contiguous with margin of anterior lobe of 5; posterior lobe of 5 deeper than anterior lobe, hidden below 2nd joint of peraeopod 3; 6 and 7 ovate, deeper than long.

Pleon segment 1 with antero-inferior angle quadrate, postero-inferior angle rounded; postero-inferior angle of segment 2 quadrate, of segment 3 shortly produced in a short acute point, margin above straight; dorsal profile of segment slightly gibbous.

Telson longer than basal width, cleft to base, lobes tapering evenly to acute apices, smooth, without any spinules.

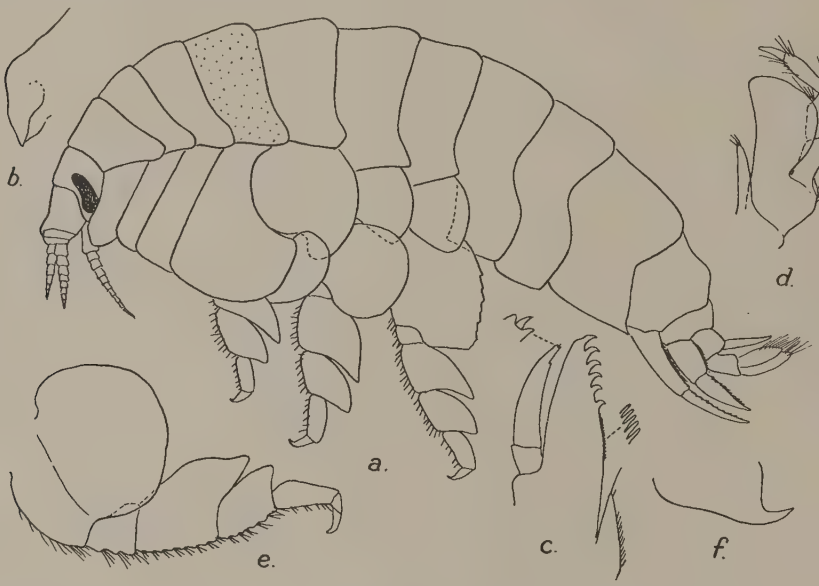

Fig. 3. *Shackletonia robusta*, Brnrd. *a.* General view, punctuation indicated on segment 4. *b.* Profile of epistome and upper lip. *c.* Maxilla 1. *d.* Maxilliped. *e.* Peraeopod 5. *f.* Pleon segment 3 of young (St. 123).

Antenna 1, 1st joint large and stout, slightly produced on inner upper apex, 2nd and 3rd joints very short, flagellum 9-jointed, accessory flagellum nearly as long as flagellum, 6-jointed. Antenna 2 slightly longer than antenna 1, 5th joint shorter than 4th, flagellum 11-jointed.

Epistome convex in front, passing evenly into the upper lip, without any deep intervening groove or notch. Mandible elongate, cutting edge straight, with denticle at each end, oblique, secondary cutting plate and spine row obsolete, molar weak, conical, palp inserted just behind molar, 3rd joint shorter than 2nd, falcate, a comb-like row of spine setae on margin of 3rd joint and distal half of 2nd joint. Lower lip with lobes apically subacute. Maxilla 1 slender, inner lobe feeble, tipped with 1 seta and 1 setule, outer lobe strong, apex oblique, with six strong hook-like spines, followed by a comb-like row of short spinules, palp 2-jointed, 2nd joint not quite reaching apex of outer lobe, tapering distally to a subacute apex, with one minute spinule, another minute spinule on inner margin just below apex. Maxilla 2 slender, inner lobe shorter and narrower than outer, both tipped with setules and rather strong spine setae. Maxilliped with inner plate slender, tipped with three spines; outer plate large, extending to middle of 3rd joint of palp, margin quite smooth and unarmed; 4th joint of palp well developed.

Gnathopod 1 simple, stout. Gnathopod 2 much more slender, 6th joint about two-thirds length of 5th, its lower apex produced in a short rounded lobe opposed to the finger.

Peraeopods 1 and 2 moderately stout. Peraeopods 3–5 very stout, 2nd joints strongly expanded, especially in peraeopods 3 and 4, where they are broader than long, hind margins convex, scarcely notched, in peraeopod 5 oblong, upper and lower hind angles quadrate, hind margin gently convex, slightly notched; 4th and 5th joints also strongly expanded especially in peraeopods 3 and 4; anterior margins of 2nd–6th in all three peraeopods strongly armed with spines and spinules.

Uropod 1 not extending beyond apex of telson, upper outer margin of peduncle strongly spinulose, rami acuminate, outer margin of outer ramus spinulose, and inner margin of inner ramus also, but to a less extent. Uropod 2 with peduncle stout, similar to uropod 1 in armature. Uropod 3 extending to apex of telson, rami ovate, apices subacute, inner margins of both rami with dense fringe of plumose setae, 2nd joint of outer ramus represented by a minute spinule.

Accessory branchiae developed on segments 2–6, one on each of segments 2–5, two on segment 6.

In the young specimen (St. 123) pleon segment 3 has a considerably more produced postero-inferior angle, and each lobe of telson has a minute apical spinule. The eyes are smaller and more oval.

Even the type specimen shows no sign of penial processes or brood lamellae.

Remarks. This form bears a close general resemblance to *Waldeckia obesa*, an example of which was caught in the same haul (St. 170), but the relations of the 4th and 5th side-plates and the expanded joints of peraeopods 3–5 at once distinguish it.

Schellenberg (1928, *Zool. Anz.*, LXXIX, p. 285), in a preliminary account of *Stephensenia haematopus*, claims on analogy with the members of the Haustoriidae that the expansion of the joints of the last three peraeopods indicates a burrowing mode of life. Although this feature is rare in the Lysianassidae, it is not unknown, as it occurs in *Acidostoma*, *Menigrates* and *Onisimus plautus*; in fact the fossorial character of peraeopods 3–5 is better developed in *Acidostoma* than it is in *Stephensenia*.

If the expansion of the joints of the last three peraeopods is really indicative of fossorial habits, the present form must certainly be put in the category of burrowing species. In *Acidostoma*, however, the mouth-parts are considered (Sars, 1895, p. 38) to indicate a semi-parasitic mode of life. Direct observations are required rather than speculations as to the possible functions of certain features. The nature of the bottom at St. 170 is given as "rock," and at St. 123 as "grey mud."

Genus **Acidostomella**, Schell.

Schellenberg, 1926 *b*, p. 197.

As pointed out below, the possession of a 2-jointed mandibular palp as originally described must be regarded as an unconfirmed character of the genus. No accessory branchiae.

Phoxostoma, Brnrd. (1925), is distinguished by the mandibular palp being set far back at the base of the trunk, the very short unguiform 4th joint of the palp of the maxilliped, and by having no groove between the upper lip and the epistome. The peculiar bulbous expansion at the base of the 2nd joint of the palp of maxilla 1 is not found in *Phoxostoma*, though this joint has the same stiff knife-like character as in *Acidostomella*.

Acidostomella cultrifera, Schell.

Schellenberg, 1926 *b*, p. 197, fig. 1.

Occurrence: 1. St. 39. South Georgia. 1 ♀ 9 mm., 1 juv. 4·5 mm.
2. St. 160. Shag Rocks. 1 ♀ 8·5 mm.
3. St. WS 27. South Georgia. 2 ♀♀ 7 mm.
4. St. WS 33. South Georgia. 1 ♀ 8 mm., 1 juv. 4·5 mm.

Remarks. Agreeing with the 'Valdivia' specimen in all respects, except that the mandibular palp is 3-jointed. The 3rd joint is two-thirds the length of the 2nd and is setose as usual. The apex of the 2nd joint bears setae as in Schellenberg's figure, and it would seem that the absence of a 3rd joint was accidental. Inner ramus of uropod 2 constricted. Schellenberg (1931, p. 22) now regards this form as synonymous with *Socarnoides kergueleni*, Stebb.

Distribution. Kerguelen, 5–10 m.

Genus **Acontiostoma**, Stebb.

Stebbing, 1906, p. 15.

Acontiostoma marionis, Stebb.

Stebbing, 1888, p. 709, pl. xxx and p. 714, pl. xxxi (*magellanicum*, = juv.).
Stebbing, 1906, p. 15, fig. 4 and p. 15 (*magellanicum*).
Stebbing, 1914, p. 356.
Chilton, 1912, p. 462.
Schellenberg, 1931, p. 5.

Occurrence: St. 55. Falkland Islands. 1 ♀ with embryos 10 mm.

Remarks. The embryo has 1–2 spine setae on uropod 3 and two spines on the telson, but lacks the hump on pleon segment 4. These features and the finding of an adult *marionis* in the Magellanic region support the view that *magellanicum* should be regarded as the young of *marionis*.

The colour is noted as "pure white with pink antennae". This seems to show that Chilton's endeavour to identify "bright red" specimens from New Zealand with this species requires further investigation.

The present specimen is larger than either the 'Challenger' or the 'Scotia' specimens. The strongly chitinized apices of the outer plates of the maxilliped are very noticeable.

Distribution. Marion Island 90–135 m.; Cape Virgins 100 m.; Gough Island 100 fathoms; Falkland Islands; Kerguelen.

Genus Stomacontion, Stebb.

Stebbing, 1906, p. 16.
Barnard, 1916, p. 109.

The species described below is provisionally placed in this genus, though differing in certain respects. In other respects it combines the characters of both *Acontiostoma* and *Stomacontion*. From both it differs noticeably in the 1st gnathopod.

Chilton (1912) was of opinion that *Stomacontion* was not generically distinct from *Acontiostoma*, and in describing *S. capense* I was of the same opinion. But further study of these forms is necessary. If the palp of maxilla 1 is of generic importance the 1st gnathopod might also be considered as such.

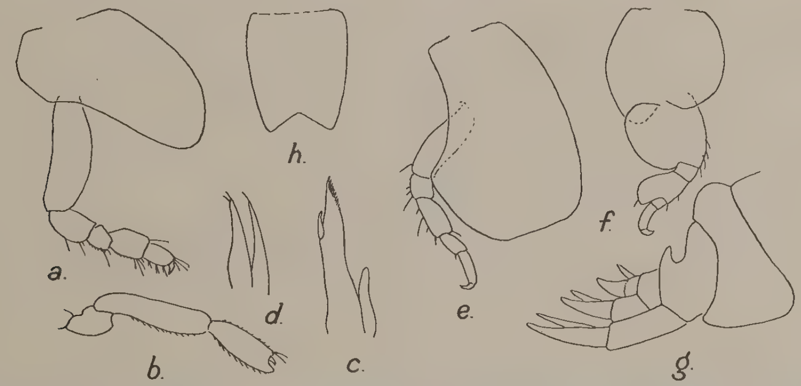

Fig. 4. *Stomacontion insigne*, n.sp. *a*. Gnathopod 1. *b*. Gnathopod 2. *c*. Maxilla 1. *d*. Maxilla 2. *e*. Peraeopod 2. *f*. Peraeopod 3. *g*. Pleon segments 3–6 and uropods. *h*. Telson.

Stomacontion insigne, n.sp. (Fig. 4).

Occurrence: St. 160. Shag Rocks. 1 specimen about 6 mm.

Description. Integument (as preserved) moderately indurated, smooth. Eyes absent. Side-plates deep, non-setose, 1st subtriangular but not markedly shorter than 2, 4 somewhat truncate below, 5 with posterior lobe deeper than anterior. Pleon segment 3 remarkably shortened dorsally, forming a rounded hump, postero-lateral angle quadrate, slightly produced; segment 4 falling away abruptly from segment 3, with a strong upturned process on posterior margin. Telson oblong, slightly longer than broad, apex angularly and shallowly excised.

Antenna 1 stout, 2nd and 3rd joints very short, flagellum 4-jointed, 1st joint longest, accessory flagellum 2-jointed, 1st joint slender, longer than 1st joint of flagellum, 2nd joint minute. Antenna 2, 5th joint shorter than 4th, flagellum subequal to 5th joint, 4-jointed.

Mandible without molar, palp set far back. Maxilla 1, inner lobe without setae, palp minute, 1-jointed. Maxilla 2, both lobes slender, with 1–2 apical setae. Maxilliped, outer plate apically subacute, inner distal margin shallowly excised, 4th joint of palp quite rudimentary.

Gnathopod 1, 6th joint shorter and narrower than 5th, ovate. Gnathopod 2, 6th joint distinctly shorter than 5th, only about two-thirds its length.

Peraeopods 1–5 in general similar to those of *pepinii*, but hind margin of 2nd joint of peraeopods 3–5 quite smooth; 5th joint abruptly narrower than the expanded 4th.

Uropods 1 and 2 biramous, rami smooth. Uropod 3 consisting of a rather stout conical peduncle, without trace of rami.

Genus **Amaryllis**, Hasw.

Stebbing, 1906, p. 23 and p. 717 (*Vijaya*).
Barnard, 1925, p. 324.

Amaryllis macrophthalma, Hasw.

Stebbing, 1888, p. 707, pl. xxix.
Barnard, 1916, p. 114.
Schellenberg, 1926, p. 243 (references); 1931, p. 10.

Occurrence: 1. St. 51. Falkland Islands. 1 ♀ 12 mm., from kelp root.
2. St. 91. South Africa. 2 ♂♂, 2 ♀♀ 10 mm., 4 immat. 6–7 mm.
3. St. 222. Cape Horn. 1 ♀ 13 mm.
4. St. WS 71. Falkland Islands. 1 ovig. ♀ 15 mm.
5. St. WS 85. Falkland Islands. 1 ♂ 14 mm., 2 ♀♀ 14–15 mm., 3 ovig. ♀♀ 14, 16 and 17 mm.

Remarks. This appears to be the only occasion on which this species has been taken in this area since the 'Challenger' took a small specimen off Cape Virgins. The specimens do not differ in any respect except size from South African specimens. The ♂ is not fully adult as the 2nd antennae are not longer than in the ♀. The eyes are dark.

The distribution is rather remarkable and it might perhaps be worth while to re-examine the East African specimen (Walker, 1909, p. 327) to see whether it is not really referable to the Cingalese species *tenuipes*.

Distribution. Australasia; South and East Africa; Cape Virgins, 55 fathoms.

Genus **Cyphocaris**, Boeck.

Schellenberg, 1926, p. 243; 1926 *b*, p. 202.

Schellenberg in the 'Valdivia' Report has discussed the value of the specific characters of the species in this genus, and has shown that certain characters undergo considerable change during growth.

C. richardi must certainly be regarded as the least specialized, followed by *anonyx*. The prolongation of the 2nd joint of peraeopod 3 and the enlargement of the 6th joint of peraeopods 1–4 is a further development of a line of evolution already indicated in certain examples of *richardi*.

The three species *bouvieri*, *challengeri* and *faurei* are closely related to one another, much more so than to *richardi* and *anonyx*. The transformation of the 2nd joint of peraeopod 3 into a sharp spine containing glands, which are possibly poison glands, might almost be regarded as justifying generic distinction.

Cyphocaris richardi, Chevr.

Chilton, 1912, p. 464, pl. i, figs. 1–4 (*anonyx*, *non* Boeck).
Stephensen, 1915, p. 37, figs. 21, 22.
Schellenberg, 1926, p. 245, fig. 4; 1926 *b*, p. 206, pl. v, fig. 1 and text-figs. 2*a*, 3, 4; 1929, p. 195; 1931, p. 15.

Occurrence: 1. St. 8. South Atlantic. 1 ♂ 25 mm., 3 ♀♀ 26–27 mm.[1]
2. St. 71. South-west Atlantic. 1 ♂ 27 mm., 2 ♀♀ 30 mm., 31 immat. 16–21 mm.
3. St. 72. South-west Atlantic. 1 ♀ 31 mm.
4. St. 76. South-west Atlantic. 1 ovig. ♀ 31 mm.
5. St. 78. South Atlantic. 7 immat. 14–20 mm.
6. St. 81. South Atlantic. 1 immat. 21 mm.
7. St. 84. South-east Atlantic. 1 immat. 21 mm.
8. St. 86. South-east Atlantic. 2 ♀♀ 22 and 24 mm.
9. St. 89. South Africa. 2 immat. 20, 21 mm.
10. St. 101. South Africa. 4 ♂♂ 23–25 mm., 8 ♀♀ 25–30 mm.
11. St. 107. South-east Atlantic. 3 ♀♀ 23–30 mm.
12. St. 114. Bouvet Island. 3 ♂♂ 23–24 mm., 10 ♀♀ 24–30 mm., 4 immat. 17–19 mm.
13. St. 197. South Shetlands. 1 ♀ 38 mm., 1 ovig. ♀ 40 mm.
14. St. 198. South Shetlands. 1 ♂ 36 mm.
15. St. 239. South-west Atlantic. 4 ♂♂ 20–22 mm., 8 ♀♀ 22–31 mm., 3 ovig. ♀♀ 30–31 mm., 8 immat. 16–20 mm.
16. St. 253. South-east Atlantic. 7 immat. 14–21 mm.
17. St. 256. South-east Atlantic. 1 ♂ 20 mm., 1 ♀ 21 mm.

REMARKS. Notes 17, 18, 19, all referring to the specimens caught at St. 8, read as follows: "deep red, rostrum white with pale red tip", "red, rostrum slightly paler red", "orange-red, rostrum broken at tip, but whitish". No. 2, 5 and 6 are recorded as being "bright orange", "bright orange-red" and "bright scarlet" respectively.

All the present localities lie between about $32\frac{3}{4}$° S and $52\frac{1}{4}$° S, with two stations also in the South Shetlands. Chilton's record (as *anonyx*) is the most southerly (71° 50′ S) yet recorded. It is interesting to note that this species was not taken at any station on the homeward journey from Cape Town, i.e. in the Benguella Current along the west coast of Africa, in contrast with the other species recorded below.

Ovigerous ♀♀ were taken in April (South Shetlands) and June (north-east of Falkland Islands).

The largest ♀♀ (no. 13) and the largest ♂ (no. 14) both came from the higher latitudes.

The least depth at which specimens were caught was 76 m. (no. 14); this was a night haul, but at the neighbouring station (no. 13) the species was not caught either by day or by night at lesser depths than 750–500 m. With this exception there is no evidence that the species ascends towards the surface at night.

DISTRIBUTION. Atlantic: 54° N–37° N and 14° S–55° S and nearly 72° S, 0–4900 m. Pacific.

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[1] All measurements in this genus are exclusive of the rostrum.

Cyphocaris anonyx, Boeck.

Stebbing, 1888, p. 656, pl. xvi (*micronyx*).
Chevreux, 1900, p. 165, pl. xiv, fig. 11 (coloured) (*micronyx*).
Schellenberg, 1926, p. 244; 1926 *b*, p. 210, pl. v, fig. 2 and text-figs. 2 *b*, 5; 1929, p. 195.
Pirlot, 1929 *a*, p. 5.
Non Chilton, 1912, p. 464 (*richardi*).

Occurrence: 1. St. 78. South Atlantic. 2 ♀♀ 13 mm.
2. St. 81. South Atlantic. 3 ♀♀ 12–13 mm.
3. St. 87. South-east Atlantic. 3 ♂♂ 10–12 mm., 3 ♀♀ 12–13 mm., 1 immat. 8 mm.
4. St. 89. South Africa. 4 ♀♀ 10–13 mm.
5. St. 253. South-east Atlantic. 1 ♀ 13 mm.
6. St. 256. South-east Atlantic. 2 ♀♀ (1 ovig.) 13–14 mm., 2 juv. 8–9 mm.
7. St. 281. South Atlantic. 3 ♀♀ 12–13 mm.
8. St. 287. Mid-Atlantic. 3 ♀♀ 9–12 mm.
9. St. 295. Mid-Atlantic. 1 ♀ 13 mm.

REMARKS. No. 2 is recorded as being "bright scarlet". The present collection fills gaps in, but does not materially extend, the known distribution of this species.

DISTRIBUTION. Atlantic: 78° N–35½° S, 310–3000 m. Indo-Pacific.

Cyphocaris challengeri, Stebb.

Stebbing, 1888, p. 661, pl. xvii.
Chevreux, 1905 (*Bull. Inst. océan. Monaco*, no. 27), p. 1, figs. 1, 2 (*alicei*).
Schellenberg, 1926, p. 243; 1926 *b*, p. 212, pl. v, fig. 3 and text-figs. 2 *d*, 6–10; 1929, p. 195.
Pirlot, 1929 *a*, p. 7.

Occurrence: 1. St. 78. South Atlantic. 1 ♂ 11 mm., 1 juv. 7 mm.
2. St. 83. South-east Atlantic. 1 ♂ 11 mm.
3. St. 87. South-east Atlantic. 6 ♂♂ 8·5–10 mm., 10 ♀♀ 6–9 mm. (2 ovig.).
4. St. 89. South Africa. 2 ♂♂ 9 mm., 6 ♀♀ 7–8 mm. (1 ovig.).
5. St. 267. South-west Africa. 1 ovig. ♀ 9 mm.

REMARKS. Ovigerous ♀♀ were found in June and July. The shallowest depths at which the 'Discovery' took this species were 650 (–0) and 450–550 (–0) m. (nos. 2 and 5), both of which were night hauls. Where there are so few records this has no great significance.

DISTRIBUTION. Atlantic: 36° N–35½° S, 5000–0 m. Indo-Pacific.

Cyphocaris faurei, Brnrd.

Barnard, 1916, p. 117, pl. xxvi, fig. 4.
Schellenberg, 1926 *b*, p. 215, pl. v, fig. 4 and text-figs. 2 *e*, 11, 12; 1929, p. 195.

Occurrence: 1. St. 81. South Atlantic. 1 ovig. ♀ 22 mm., 1 immat. 13 mm.
2. St. 83. South-east Atlantic. 1 ♀ 22 mm.
3. St. 86. South-east Atlantic. 1 ♀ with embryos 22 mm.
4. St. 107. South-east Atlantic. 1 ♂ 25 mm., 1 ♀ with embryos 23 mm.
5. St. 256. South-east Atlantic. 1 juv. 8 mm.
6. St. 285. Mid-Atlantic. 1 ♂ 19 mm.
7. St. 288. Mid-Atlantic. 2 ♀♀ 19 and 23 mm., 1 immat. 11 mm.
8. St. 296. Mid-Atlantic. 1 ♂ 18 mm.

Remarks. No. 1 is recorded as being "bright scarlet". The present collection extends the known distribution in the Atlantic to 8° 47′ W long., 45° S lat. and to 8° 12′ N lat. It would appear that the species is taken in lesser depths during the night than during the day.

Distribution. Atlantic: 36° S, 17½° E, and off Cape Point, S. Africa. Indian Ocean, off East London (South Africa). Pacific.

Genus **Metacyphocaris**, Tattersall.

Tattersall, 1906, p. 29.

The occasional presence of a rudimentary mandibular palp somewhat weakens the reasons for the generic separation of this form from *Paracyphocaris* Chevr. The reduced inner ramus of uropod 3, however, is an additional difference between the two genera.

Metacyphocaris helgae, Tattersall (Fig. 5).

Tattersall, 1906, p. 29, pl. iii, fig. 1, pl. iv.
Stephensen, 1923, p. 54.
Schellenberg, 1926 *b*, p. 216 and pp. 235, 238, 241, text-figs. 26 *c*, 27; 1927, p. 666, fig. 60; 1929, p. 196.
Pirlot, 1929 *a*, p. 8.

Occurrence:
1. St. 78. South Atlantic. 2 immat. 11–12 mm.
2. St. 85. South-east Atlantic. 1 immat. 13 mm.
3. St. 281. Mid-Atlantic. 1 ♀ with brood lamellae 17 mm., 1 immat. 13 mm
4. St. 287. Mid-Atlantic. 2 immat. 10–11 mm.
5. St. 296. Mid-Atlantic. 1 immat. 11 mm.

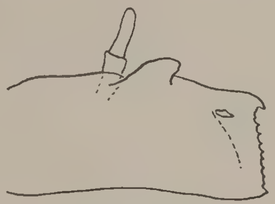
Fig. 5. *Metacyphocaris helgae*, Tattersall. Mandible of ♀. (St. 281.)

Remarks. The large ♀ (no. 3) seems to be the first known specimen which is approximately mature. The brood lamellae are elongate linguiform, with setose margins. It is also remarkable in that both mandibles retain a 2-jointed rudiment of the palp.

The ventral surface in the smaller specimens is more or less bulging, a fact which may indicate parasitic (blood-sucking) habits.

The known distribution in the Atlantic is much extended by the above finds, viz. to south of the equator (2° 49′ S) in the Gulf of Guinea, and to 35° S Mid-Atlantic.

Distribution. Atlantic: 64° N–47° N, 1800–2800 m.

Genus **Paralysianopsis**, Schell.

Schellenberg, 1931, p. 7.
Barnard, 1931, p. 425 (*Austronisimus*).

Side-plate 1 not expanded below, 5 evenly bilobed. Pleon segment 3 with postero-inferior angle produced, rounded. Telson short, ovate, with a short terminal notch. Antenna 1 stout, 2nd and 3rd joints very short. Epistome straight, not prominent; upper lip produced in an acute process. Mandible with molar moderate, palp attached over molar. Maxilla 1, outer lobe with 7–8 spines, palp moderately slender. Maxilla 2, lobes moderately slender, subequal in length. Maxilliped, outer plate with smooth inner margin. Gnathopod 1 feebly subchelate. Uropod 2 with inner ramus constricted. Uropod 3, 2nd joint of outer ramus two-thirds length of 1st. Branchiae simple, apparently without accessory branchiae.

REMARKS. A genus which has many of the characters of *Onisimus*, but which differs in the subequal and more slender lobes of maxilla 2, and the large 2nd joint of the outer ramus of uropod 3. In both of these characters it resembles *Lysianella*, but lacks the enlarged 4th joint of antenna 2 found in that genus. The produced upper lip is comparable with that of *Lysianella*. From *Paronesimus* it is distinguished by the 2nd maxilla. The epistome and upper lip for this latter genus are not described, unless we can assume from Stebbing's words (1894, *Bijdr. Dierk.*, XVII, p. 14): "The single specimen was dissected under the impression that it belonged to *Chironesimus debruynii*. . .", that the upper lip was strongly projecting as in that species. Further distinguished from *Pseudonesimus*, Chevr. 1926 by the feebly subchelate 1st gnathopod and the 3rd uropod.

The other genus to which this form might be run down in Stebbing's key (1906) is *Paratryphosites*, but the epistome and upper lip are not described, at least not in the works accessible to me.

Paralysianopsis odhneri, Schell. (Fig. 6).

Schellenberg, 1931, p. 7, fig. 2.
Barnard, 1931, p. 425 (*A. rhinoceros*).

Occurrence: St. WS 25. South Georgia. 1 ♀ 6 mm.

DESCRIPTION. Integument (as preserved) not indurated. Head with anterolateral angle quadrate. Eyes oval, dark. Side-plate 1 parallel-sided, somewhat rounded below; 5 evenly bilobed. Postero-inferior angles of pleon segments 1 and 2 quadrate, of segment 3 produced in a rounded lobe. Pleon segment 4 dorsally depressed behind the

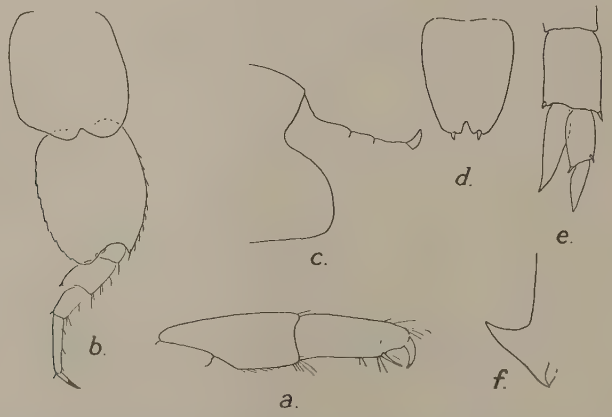

Fig. 6. *Paralysianopsis odhneri*, Schell. *a*. Gnathopod 1. *b*. Peraeopod 3. *c*. Pleon segments 3–6. *d*. Telson. *e*. Uropod 3. *f*. Profile of epistome and upper lip.

proximal hump, but not carinate. Telson short, oval, with a short apical notch, an apical spinule on each lobe.

Antenna 1, flagellum 9-jointed, accessory flagellum 5-jointed. Antenna 2, flagellum 8-jointed.

Epistome straight, upper lip produced in an acute, slightly upturned, process. Mandible, molar moderately strong, palp attached above molar or above its posterior margin, but not behind it. Maxilla 1, outer lobe with 7–8 serrulate spines, palp extending beyond apex of outer lobe, moderately slender, apex with four short stout spinules and a seta. Maxilla 2, both lobes nearly equal in length and moderately slender. Maxilliped, inner plate with two apical short spinules, outer plate with smooth margin.

Gnathopod 1, 6th joint nearly as long as (upper margin) 5th, slightly tapering, palm short, oblique, defined by a rather long slender spine and a seta. Gnathopod 2, 6th joint half length of 5th, narrow ovate, minutely subchelate.

Peraeopods 1–5 slender, 2nd joint in peraeopods 3–5 ovately expanded, longer than wide, hind margin serrulate, 4th joint moderately expanded in peraeopod 3, but less so in peraeopods 4 and 5.

Uropod 2, rami slender acuminate, inner ramus constricted. Uropod 3 rather stout, rami a little longer than peduncle, outer ramus slightly longer than inner, its 2nd joint two-thirds length of its 1st joint.

DISTRIBUTION. Falkland Islands.

Genus **Lysianassa**, M. Edw.

Stebbing, 1906, pp. 37, 718.

Lysianassa variegata (Stmpsn.).

Stebbing, 1888, p. 682, pl. xxiii and 1910 *a*, p. 449.

Occurrence: 1. St. 90. South Africa. 2 ♀♀ 9–10 mm.
2. St. 91. South Africa. 2 ♀♀ (1 ovig.) 7·5 mm.

DISTRIBUTION. South Africa (False Bay to East London).

Lysianassa falklandica, n.sp. (Fig. 7).

Occurrence: 1. St. WS 85. Falkland Islands. 1 ♀ 7 mm. *Type*.
2. St. WS 97. Between Falkland Islands and South America. 2 ovig. ♀♀ 9 mm., 1 immat. 6·5 mm.

DESCRIPTION. Integument indurated. Head, peraeon and pleon dorsally with minute scattered setules. Head with antero-lateral angle quadrate or subacute. Eyes rather narrow oval-reniform, brown.

Side-plates 1–4 deep, 1 slightly expanded forwards, 4 not strongly excavate, the excavation evenly rounded.

Pleon segment 4 with dorsal profile slightly excavate in middle; postero-inferior angles of segment 1 rounded, of 2 quadrate, of 3 produced backwards in a rounded lobe.

Telson longer than wide, distal margin truncate or feebly excised, a spinule on each apex.

Antenna 1, flagellum 7-jointed, accessory flagellum 3-jointed. Antenna 2, flagellum 9-jointed.

Epistome not prominent, separated by a deep groove from the upper lip which is produced in a linguiform process. Mouth-parts as in *plumosa* (Sars, 1895, pl. xvi, fig. 1, as *costae*), but inner lobe of maxilla 2 scarcely broader than outer lobe.

Gnathopod 1, 2nd joint stout, straight, 5th oblong, 6th longer than 5th, narrow, tapering. Gnathopod 2, 6th joint rather more than half length of 5th, feebly chelate.

Peraeopod 3, 2nd joint strongly expanded, subcircular, hind margin feebly notched. Peraeopod 4, 2nd joint ovoid, longer than wide, hind margin distally emarginate. Peraeopod 5, 2nd joint broadly ovate, nearly subcircular.

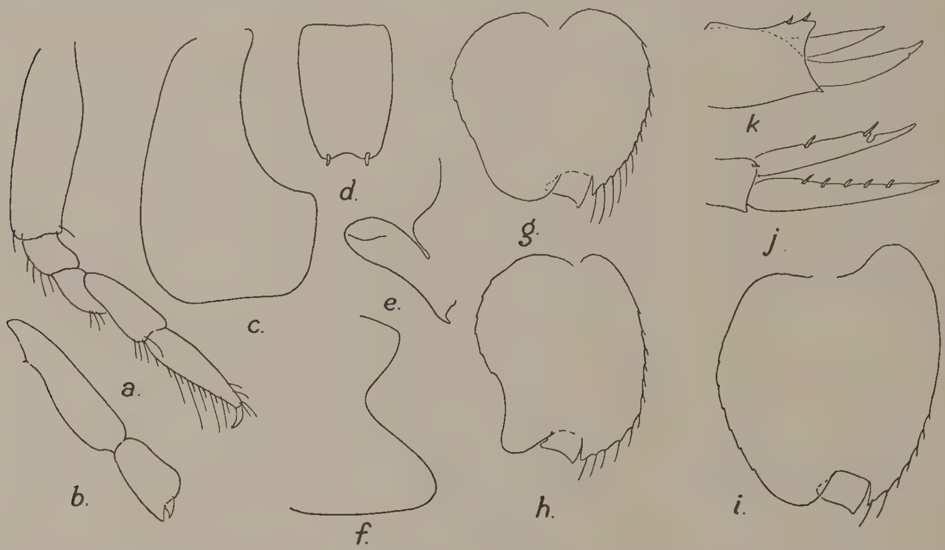

Fig. 7. *Lysianassa falklandica*, n.sp. *a*. Gnathopod 1. *b*. Gnathopod 2. *c*. Side-plate 4. *d*. Telson. *e*. Profile of epistome and upper lip. *f*. Pleon segment 3. *g*. 2nd joint of peraeopod 3. *h*. 2nd joint of peraeopod 4. *i*. 2nd joint of peraeopod 5. *j*. Uropod 2. *k*. Uropod 3.

Uropod 2, inner ramus constricted. Uropod 3 not very short, the rami not rudimentary or reduced, upper outer margin of peduncle distally lobed, with 1–2 spinules on its upper margin.

Branchiae tending to be slightly folded. Accessory branchiae absent.

REMARKS. It is perhaps possible that this species may prove to be the same as Dana's *nasuta* from Rio de Janeiro, which Stebbing (1906) regards as a doubtful or inadequately described species. Bate's description (1862, p. 66), quoted from Dana, gives no criteria for comparison; his figure (pl. x, fig. 6), which is shaded and therefore taken from an actual specimen, shows the postero-inferior angle of pleon segment 3 much less produced than in the present species. The 1st antenna is described and figured as longer than the 2nd antenna, which is not so in the present specimens.

Genus Socarnoides, Stebb.

Stebbing, 1888, p. 690 and 1906, p. 47.
See also Schellenberg, 1931, pp. 6, 22.

Although there are no representatives of this genus in the 'Discovery' collection, I make no apology for introducing the following discussion on these Antarctic or sub-Antarctic forms. (But see also under *Acidostomella cultrifera*, *supra* p. 32).

The type species is *kergueleni*, Stebb. 1888.

In 1888 Stebbing, with one of S. I. Smith's specimens of "*Lysianassa*" *kidderi* before him, pointed out the differences between it and *Socarnoides kergueleni*, and in 1906 assigned the former to the genus *Nannonyx*, Sars 1891.

In 1909 Chilton united *S. kergueleni*, *Ephippiphora kröyeri*, White, *N. thomsoni*, Stebb., and *L. stebbingi*, Thoms., with *kidderi*, Smith, but under the later generic name *Nannonyx*.

Stebbing then referred (1910, p. 571) *N. thomsoni* to a new genus *Parawaldeckia*, which agreed with *Waldeckia* in possessing accessory branchiae.

In 1922 Tattersall accepted Chilton's synonymy and Stebbing's genus *Parawaldeckia*, and expressed the hope that this form, described under at least half a dozen specific names and referred to three genera, had at last come to rest. But if all these "species" are really synonymous, he defeated his own object by adopting the oldest specific name and the latest generic name. Monod (1926) adopted *Nannonyx*, and Stephensen (1927) followed Tattersall. The name should be *Socarnoides kidderi* (Smith).

But it appears to me to be very doubtful whether all these forms are legitimately united.

In 1921 Chilton (1921 *a*, p. 35) was able to distinguish two of the forms he had previously united: a form which he refers to *Ephippiphora kröyeri* (using the preoccupied generic name) and another which he refers to *Nannonyx kidderi*, with *Parawaldeckia thomsoni* as a synonym. I feel sure that our knowledge of these forms is still inadequate, in spite of Chilton's words (1909, p. 617) that "this species has already been fully described by various other authors". Some points of conflict in these descriptions may be discussed.

The accessory branchiae were first mentioned by Stebbing (1910) and led to the institution of the genus *Parawaldeckia* "from its agreement with *Waldeckia* in possessing accessory lobes to the branchial vesicles". Presumably they are present on segments 2–6, but neither Stebbing nor Stephensen (1927, p. 301) state the actual number. It is not fair to assume that Stebbing overlooked them in describing *S. kergueleni*. Nor are they mentioned by Sars in the description of *Nannonyx göesii*. We may therefore separate a form *Parawaldeckia thomsoni* (Stebb.), New Zealand, which is further characterized by having the postero-inferior angle of pleon segment 3 "acutely upturned" (Stebbing, 1906, p. 36). The 3rd uropod is very short with the inner ramus almost rudimentary, as in *Nannonyx*. But the character of the epistome and upper lip is unknown.

The epistome and upper lip are not at all prominent in *N. göesii* or in the form figured by Monod (1926, fig. 50). But in *Socarnoides* they are both prominent, the epistome forming a very conspicuous plate. Stephensen's fig. 2 (1927) shows a strongly projecting profile very similar to that of the *upper lip* in *kergueleni*, though the description says the epistome projects. What was the character of the epistome and upper lip in Chilton's (1909 and 1921*a*) and Tattersall's specimens?

A further point arises in the comparison of the shape of the 4th side-plate. Monod figures a very deep excavation, the lobe extending backwards to the end of the 5th side-plate. Thomson (1892, *Proc. Roy. Soc. Tasman.*, p. 64, pl. v, fig. 10) and Tattersall figure a *rectangular* excavation. Both forms are utterly different from Stebbing's figure of *kergueleni*, and surely the agreement between Thomson's and Tattersall's figures is not accidental, but expresses a real difference which should cause one to hesitate before uniting these forms with *kergueleni*. Is the *Parawaldeckia kidderi* of Tattersall (which has accessory branchiae) a synonym of "*Lysianax*" *stebbingi*, Thoms.?

A comparison of the figures of the 1st gnathopod (and to a less extent the 2nd gnathopod) given by Stebbing (1888), Thomson (1892), Tattersall (1922), Monod (1926), and Stephensen (1927) leads one also to the conclusion that several (two at least) species have been unjustifiably united.

This criticism may sound drastic, but it shows that the union of all these forms under the one name *kidderi* is most unfortunate. One must admit that Stebbing's description of *kergueleni* is a full and satisfactory description; Stephensen's specimens are easily recognizable, as are Monod's and probably also Tattersall's. Though Stephensen compares and contrasts his specimens with *kergueleni*, one would have liked a figure of the 4th side-plate; and in the case of the 'Belgica' specimens one would like to know whether accessory branchiae were present.

One may perhaps hazard a guess that the 'Belgica' specimens will prove to be a species of true *Nannonyx*; that *P. kidderi*, Tattersall will be synonymous with *stebbingi*, Thoms. and a true *Parawaldeckia*, but distinct from *thomsoni*, Stebb. As for Stephensen's specimens they have the upper lip of *Socarnoides*, the 3rd uropod of *Nannonyx*, plus the accessory branchiae of *Parawaldeckia*. A thorough study of abundant Australasian material is obviously required.

Finally, although Stebbing compared his genus with *Socarnes*, Boeck, the comparison might have been made with *Lysianassa* which is closely allied with *Socarnes*. The distinctive features of *Socarnoides*, which separate it from both the other genera, are the maxillipeds and the prominent epistome, and in both of these features it shows an approach to *Socarnopsis*, Chevr., 1910.

These remarks were written before the appearance of Schellenberg's 1931 paper.

Genus **Waldeckia**, Chevr.

Chevreux, 1906, p. 13.

Waldeckia obesa (Chevr.).

Chevreux, 1906, p. 15, figs. 8–10 and 1911, p. 403.
Chilton, 1912, p. 471. (*zschauii, non Anonyx zschauii*, Pfr.)
Barnard, 1930, p. 323, fig. 1*a* (references).

Occurrence: 1. St. 170. South Shetlands. 1 ♀ 25 mm., 2 juv. 11 mm.
2. St. 172. South Shetlands. 1 ♂ 20 mm., 1 ovig. ♀ 25 mm.
3. St. 184. Palmer Archipelago. 1 ♂ 18 mm., 1 ♀ 25 mm.
4. St. 189. Palmer Archipelago. 2 ♂♂ 18 and 22 mm., 6 ♀♀ 21–22 mm. (2 ovig.).
5. St. 195. South Shetlands. 1 ♂ 18 mm., 1 ♀ 15 mm.

REMARKS. The postero-inferior angle of pleon segment 2 is quadrate with a small upturned point, as Schellenberg remarks; and the antero-inferior angle of pleon segment 1 is also quadrate.

The bathymetrical range is rather noteworthy, being from 36 m. (no. 3) to 425 m. (no. 2).

DISTRIBUTION. Coats Land; Palmer Archipelago and Graham Land; McMurdo Sound; 'Gauss' winter station; South Sandwich Group.

Genus **Aristias**, Boeck.

Stebbing, 1906, pp. 49, 718.

As regards the Antarctic species, Walker described neither the epistome nor the upper lip, and Schellenberg only described the former. A certain amount of doubt therefore arises as to the identity of the specimens listed below.

Aristias antarcticus, Wlkr. (Fig. 8 *a*, *b*).

Walker, 1907, p. 11, pl. iii, fig. 5.
Barnard, 1930, p. 324.
Non Schellenberg, 1926, p. 255, fig. 10 (*antarcticus non* Wlkr. = ? sp.nov.).

Occurrence: 1. St. 42. South Georgia. 1 ♀ 12 mm.
2. St. 45. South Georgia. 1 ovig. ♀ 12 mm.
3. St. 149. South Georgia. 3 ♀♀ 8, 9 and 11 mm.
4. St. 170. South Shetlands. 1 ♂ 7 mm., 1 ♀ 8·5 mm.
5. St. MS 71. South Georgia. 2 ♂♂ 9 mm., 6 ♀♀ 10–12 mm.

REMARKS. These specimens are referred to Walker's species solely on their agreement with his figure of the dorsal profile of pleon segment 4. Future research must show whether they agree with his type specimen as regards the epistome and upper lip. The upper angle of the upper lip is always quadrate, but varies a little in the extent to which it protrudes beyond the epistome. The telson has the lobes more tapering than in Walker's figure, but not angularly bevelled off as figured by Schellenberg. Peraeopods 1–5 have the 5th joint markedly wider than the 6th, as in Walker's figure. Uropod 3 in the ovigerous ♀ has both rami broadly ovate, much broader than in Walker's figure or

Sars' figure of *tumidus* (1895, pl. xviii, fig. 1), the margins strongly serrulate except the outer margin of the outer ramus which is smooth.

The specimens from St. 170 have the antero-lateral angle of the head more like Schellenberg's fig. 10 *a* than Walker's; perhaps the blunter angle is characteristic of younger specimens.

Schellenberg himself remarked on the differences between the 'Gauss' and the 'Discovery' (1901–04) specimens.

DISTRIBUTION. McMurdo Sound.

Aristias collinus, n.sp. (Fig. 8 *c*, *d*).

Occurrence: 1. St. 170. South Shetlands. 1 immat. (♀) 9 mm. *Type*.
2. St. 175. South Shetlands. 1 juv. 7 mm.

DESCRIPTION. Distinguished at once from *antarcticus* by the rounded upper lip, and the much deeper dorsal depression on pleon segment 4, which is followed by a rounded hump or boss (not a carina). Telson with the lobes angularly bevelled off distally as in Schellenberg's fig. 10 *b* (feebly so in no. 2, but distinctly so in no. 1).

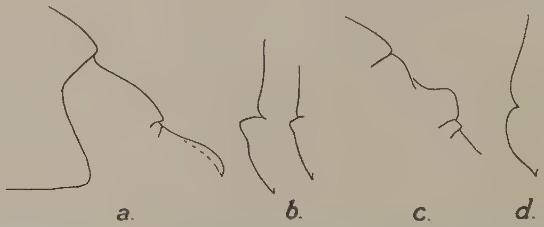

Fig. 8. *Aristias antarcticus*, Wlkr. *a*. Pleon segments 3–6. *b*. Profile of epistome and upper lip. *Aristias collinus*, n.sp. *c*. Pleon segments 3–6. *d*. Profile of epistome and upper lip.

REMARKS. I fully expect that, though this species resembles the 'Gauss' specimens from Kerguelen (referred by Schellenberg to *antarcticus*), the latter will be found to be distinct if the upper lip be closely examined.

Ambasiopsis, Brnrd.

Barnard, 1931, p. 425.

Agreeing with *Metambasia*, Steph. 1923, but differing as follows: 1st gnathopod feebly subchelate, outer plate of maxilliped non-spinose, inner ramus of uropod 2 not constricted, peraeopods 3–5, especially 5, much shorter and 4th joint more expanded, 3rd joint of antenna 2 not expanded.

The last character is provisional as the only ♂ (see *uncinata*, *infra*) may not have attained its adult characters.

Ambasiopsis georgiensis, Brnrd. (Fig. 9).

Barnard, 1931, p. 425.

Occurrence: St. 159. South Georgia. 3 ovig. ♀♀ 10–11 mm.

DESCRIPTION. Integument indurated. Head with antero-lateral angle pointed. Eyes not visible. Peraeon dorsally rounded. Side-plate 1 subtriangular, pointed below, the lower corner concealed by side-plate 2. Side-plates 2–4 deep but not closely packed, 4 with moderately deep excavation; 5 notched, the two lobes subequal; 6 similar but posterior lobe broader, though not deeper, than anterior; 7 trapezoidal, the hind margin longer than the anterior.

Pleon rounded, except for the rather high carina on segment 4, which slopes gradually on the anterior side and falls abruptly and vertically on the posterior side, very much as in *Ambasia atlantica*. Postero-inferior angles of segments 1 and 2 rounded, of 3 rather less than a right angle, the corner rounded. Telson not twice as long as wide, cleft for three-quarters of its length, lobes slightly dehiscent, apically acute with a subapical spinule on outer side, and two lateral marginal spinules.

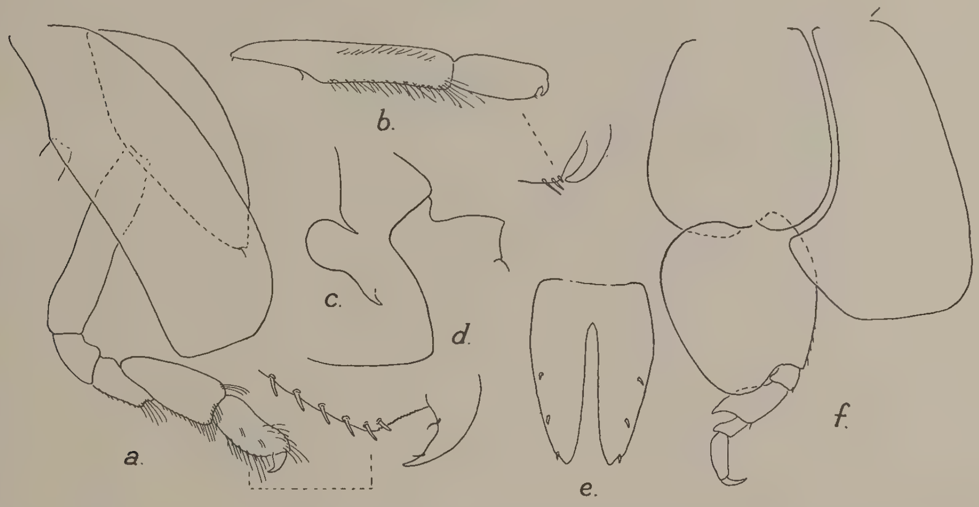

Fig. 9. *Ambasiopsis georgiensis*, Brnrd. *a*. Side-plates 1 and 2 and gnathopod 1, with palm further enlarged. *b*. Gnathopod 2, with palm further enlarged. *c*. Profile of epistome and upper lip. *d*. Pleon segments 3 and 4. *e*. Telson. *f*. Side-plates 4 and 5 and peraeopod 3.

Antenna 1, peduncle stout, 1st joint apically produced on upper margin, 2nd and 3rd joints very short, flagellum 8-jointed, 1st joint half as long as 1st peduncular joint, setose, accessory flagellum 3-jointed, 1st joint the longest, but not as long as 1st flagellar joint. Antenna 2, 4th joint longest, 5th shorter than 3rd, flagellum shorter than peduncle, 9-jointed.

Epistome not projecting, upper lip produced in a rounded lobe. Mandible, cutting edge straight with a denticle at each end, spine row minute, molar strong, truncate, setose, palp longer than trunk, inserted over molar, 3rd joint two-thirds length of 2nd. Maxilla 1, inner lobe short, ovate, tipped with two long and one short setae, outer lobe with seven feebly serrate spines, palp extending beyond outer lobe, narrow, tipped with two short stout spines and 1–2 setules. Maxilla 2, inner lobe distinctly shorter than outer, as in *faeroensis*. Maxilliped, inner plate with 3–4 apical spinules, outer plate with minutely serrate inner and distal margin but without spinule, palp rather stout.

Gnathopod 1 feebly subchelate, 6th joint shorter than 5th, oblong, upper margin slightly indented, lower margin spinose, passing into the short, oblique and minutely fimbriate palm by a rounded angle, finger short, stout, curved. Gnathopod 2, 6th joint oval, half length of 5th, with a short straight almost transverse palm, with one short spinule at the angle.

Peraeopod 3, 2nd joint broadly ovate, hind margin very obscurely notched, anterior margin spinulose distally, 4th joint moderately expanded, 3rd–6th joints very feebly armed with a few spinules and setules. Peraeopod 4, 2nd joint less broadly ovate, otherwise like peraeopod 3. Peraeopod 5, 2nd joint more broadly expanded than in peraeopod 4, but more oblong than in peraeopod 3, longer than the other joints together, 4th joint less expanded than in peraeopods 3 and 4, 3rd–6th joints rather more strongly armed with spinules.

Uropods 1 and 2 extending very slightly beyond apex of uropod 3, rami shorter than peduncles, acuminate, spinose, inner ramus of uropod 2 not constricted. Uropod 3, rami longer than peduncle, 2nd joint of outer ramus well developed, inner ramus extending to middle of 2nd joint of outer, both rami without spines or setae.

Ambasiopsis uncinata, n.sp. (Fig. 10).

Occurrence: St. 170. South Shetlands. 1 ♂ 8 mm., 1 ♀ 14 mm., 2 ovig. ♀♀ 12, 13 mm.

Description. Closely resembling *georgiensis* in general, but: pleon segment 3 with postero-inferior angle quadrate, but not sharp at the corner; segment 4 with a high conical, somewhat unciform, tooth, pointing slightly forwards; telson rather shorter in proportion to its breadth; all the antennal flagella with one more joint apiece; gnathopod 2 stouter, 5th joint broader, more triangular, 6th joint markedly narrower than 5th, upper margin not indented, lower margin more closely spinose especially near junction with palm; hind margins of 2nd joints of peraeopods 3–5 distinctly though shallowly notched.

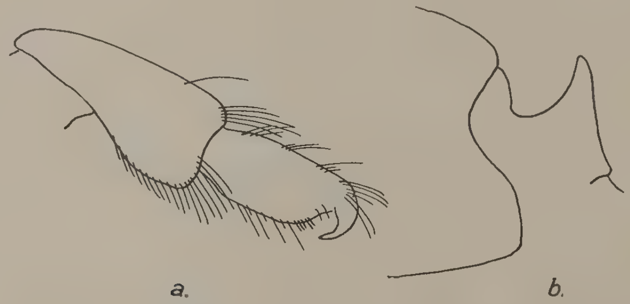

Fig. 10. *Ambasiopsis uncinata*, n.sp. *a*. Gnathopod 1. *b*. Pleon segments 3 and 4.

The 3rd joint of antenna 2 is not expanded as in *M. faeroensis*, though the ♂ specimen is probably not fully grown.

Genus **Uristes**, Dana.

Stebbing, 1906, p. 63.
Barnard, 1916, p. 126; 1925, p. 333.
Schellenberg, 1931, p. 26.

Uristes gigas, Dana (Fig. 11).

Bate, 1862, p. 89, pl. xiv, fig. 8 (after Dana).
Stebbing, 1888, p. 617, pl. vi (*Tryphosa antennipotens*); 1906, p. 64.
Walker, 1907, p. 16.

Occurrence: 1. St. 140. South Georgia. 1 ♂ 21 mm.
2. St. 144. South Georgia. 1 juv. 10 mm.
3. St. 156. South Georgia. 1 ♀ 19 mm.
4. St. 159. South Georgia. 1 ♂ 18 mm.
5. St. 175. South Shetlands. 3 ♂♂ 21, 23, 26 mm., 1 ♀ 27 mm., 4 ovig. ♀♀ 26–27 mm.
6. St. WS 53. South Georgia. 2 ♂♂ 15–16 mm., 1 ♀ 15 mm.

REMARKS. These specimens differ but little from Stebbing's description and figures. The eyes are very indistinct, but are reniform, widening below; Stebbing's figure shows punctae over the whole head, but the position of the eyes is best seen by the absence of these punctae. The whole integument is sparsely punctate.

The epistome and upper lip form nearly a straight line, with a notch at their junction; neither is at all prominent. The palp of maxilla 1, when flattened, is a little broader than in Stebbing's figure.

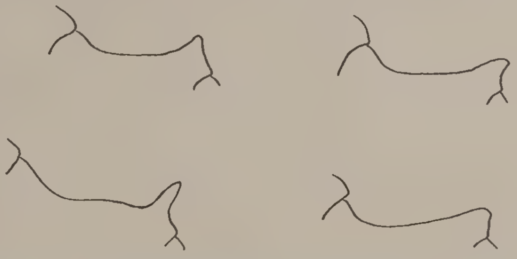
Fig. 11. *Uristes gigas*, Dana. Dorsal profiles of pleon segment 4 to show variation.

Gnathopod 1 distinctly subchelate, thus conflicting with Stebbing's key (1906, p. 11) and diagnosis, palm better developed than in Stebbing's figure which is perhaps not quite a true profile, the defining angle with two strong spines.

A single accessory branchia on both segments 5 and 6.

No sexual differences in the length of the antennae.

Note 129 gives the colour of the specimens from St. 175 as: "creamy buff, dorsally with a narrow orange-red transverse band at posterior end of each segment of thorax and abdomen, liver visible as a bluish mass; eyes deep crimson".

The capture by the 'William Scoresby' of both sexes of this species in a night haul near the surface is interesting.

DISTRIBUTION. Antarctic Seas (Dana); Heard Island, 274 m.; Ross Sea.

Genus **Cheirimedon**, Stebb.

Stebbing, 1906, pp. 66, 720.
Schellenberg, 1926, p. 262.

The original definition of this genus has been widened to include *femoratus* and *fougneri*, in which the mandibular palp arises immediately behind the molar, and the hand of gnathopod 1 is scarcely or not at all distally widened. These two species do not run down to *Cheirimedon* in Stebbing's key (1906), but to *Orchomenella* or *Orchomenopsis*, to which it must be confessed they are closely allied.

Cheirimedon femoratus (Pfr.).

Pfeffer, 1888, p. 93, pl. ii, fig. 2.
Chevreux, 1906, p. 2, figs. 1–4; 1913, p. 92 (*dentimanus*).
Chilton, 1912, p. 467.

Occurrence:
1. St. 145. South Georgia. 2 ♀♀ 13–14 mm. (the larger ovig.).
2. St. 165. South Orkneys. 58 specimens 11–15 mm., incl. ovig. ♀♀ from stomach of *Notothenia*.
3. St. 173. South Shetlands. 17 ♂♂ 9–10 mm., 8 ♀♀ (3 ovig.) 11–13 mm.
4. St. 174. South Shetlands. 6 ♀♀ 11–13 mm.
5. St. 179. Palmer Archipelago. A lot ♂♂, ♀♀, some ovig. and juv. 5–15 mm.
6. St. 190. Palmer Archipelago. 4 ♀♀ 10–12 mm.
7. St. MS 67. South Georgia. 4 ♂♂ 9 mm.
8. Deception Island, South Shetlands, 28. ii. 27. Found dead and parboiled on beach by hot springs. 50 specimens 9–15 mm., a few ♂♂ and immat., but mostly ♀♀.

REMARKS. The differences in the figures of the telson given by Pfeffer and Chevreux may well be explained, as Chilton has done, by the fact that Pfeffer did not dissect the only two specimens he had.

A single accessory branchia on both segments 5 and 6.

The two specimens from St. 145 are noticeable in having the produced point on the postero-inferior angle of pleon segment 3, the carina on segment 4, and the epistome all more prominent than in the typical form as illustrated by Chevreux.

DISTRIBUTION. South Georgia; South Orkneys; Palmer Archipelago.

Genus **Tryphosella**, Bonnier.

Stebbing, 1906, pp. 67, 720.

Tryphosella albina, n.sp. (Fig. 12).

Cf. *T. georgiana*, Schell., 1931, p. 30, fig. 13.

Occurrence: St. 170. South Shetlands. 1 ♂ 11 mm.

DESCRIPTION. Head with antero-lateral angle subacute, extending to end of 1st joint of antenna 1. Eyes invisible. Side-plate 1 subtriangular, narrowed below. Pleon segment 3 with postero-inferior angle produced in a short subacute point, segment 4 with an evenly rounded carina following the basal depression. Telson twice as long as basal width, cleft nearly to base, the lobes not dehiscent, tapering, apically notched, with a spinule in the notch.

Antenna 1, 1st joint not apically produced over 2nd, 2nd and 3rd joints very short, flagellum stout, 13-jointed, 1st joint longest, setose, other joints broader than long, with calceoli. Antenna 2, flagellum 13–14-jointed, calceoliferous.

Epistome and upper lip forming a moderately arcuate curve, with a notch at their junction. Mandible with palp inserted over the strong molar. Maxilliped with inner margin of outer plate serrulate, a few large squarish spines on the apical margin.

Gnathopod 1, 5th joint short, triangular, 6th oblong, parallel-sided, palm transverse, slightly convex, two strong spines at the angle, and a row of setae along palm, finger with a small tooth distally on inner margin. Gnathopod 2, 6th joint a little more than half length (along upper margin) of 5th, ovate, obscurely chelate.

Peraeopods 1–5 stouter than in *barbatipes*, especially peraeopods 3–5, the 4th joints strongly expanded.

Uropod 3, rami lanceolate, subequal, inner distal margins setose.

A single accessory branchia on both segments 5 and 6.

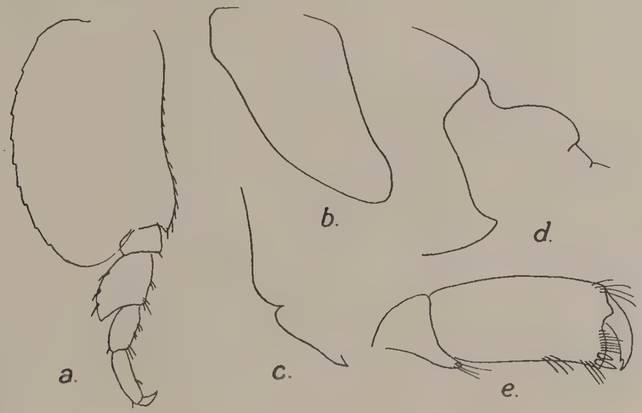

Fig. 12. *Tryphosella albina*, n.sp. *a*. Peraeopod 5. *b*. Side-plate 1. *c*. Profile of epistome and upper lip. *d*. Pleon segments 3 and 4. *e*. Gnathopod 1.

Remarks. This form seems to be allied to *barbatipes*, Stebb., from Kerguelen, but differs in the stronger hand of gnathopod 1, with its short 5th joint, and the stouter posterior peraeopods.

Genus **Tryphosa**, Boeck.

Stebbing, 1906, pp. 68, 720.
Stephensen, 1925, p. 101.
Schellenberg, 1926, p. 266.

Tryphosa kergueleni (Miers) (Fig. 13).

Stebbing, 1888, p. 623, pl. viii; 1906, p. 69.
Shoemaker, 1914, p. 74.
Schellenberg, 1926, p. 266, fig. 15 *a*; 1931, p. 34 (part).
Barnard, 1930, p. 327.

Typical form

Occurrence: 1. St. 165. South Orkneys. 1 ♂, 1 ovig. ♀ 14–15 mm. Stomach of *Notothenia*.
2. St. 174. South Shetlands. 1 ovig. ♀ 14 mm.

Hypsilophic form

Occurrence: 1. St. 45. South Georgia. 1 ♀ 10 mm.
2. St. 123. South Georgia. 1 ♂ 13 mm.
3. St. 140. South Georgia. 1 ♂ 9 mm., 4 ovig. ♀♀ 9–14 mm.
4. St. 144. South Georgia. 2 ♂♂ 11–12 mm., 3 ♀♀ 9–10 mm., 2 ovig. ♀♀ 10 mm., 1 juv. 6 mm.

REMARKS. The two forms here placed under *kergueleni* should in my opinion be regarded as specifically distinct. The raised keel on pleon segment 4 is correlated with a more prominently projecting upper lip.

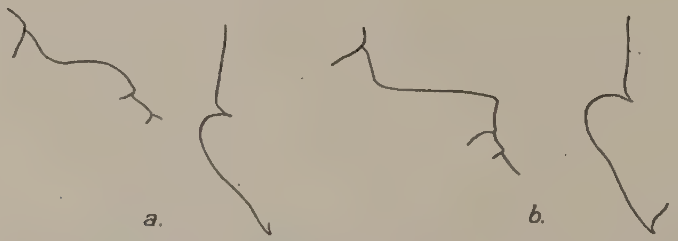

Fig. 13. *Tryphosa kergueleni* (Miers). Dorsal profile of pleon segment 4 and profile of epistome and upper lip of: *a.* typical form; *b.* hypsilophic form.

Schellenberg figures the two forms of carina, but says nothing about the upper lip. Both forms were found together at the 'Gauss' winter station. In the Discovery collection the hypsilophic form was found in a different locality and in much deeper water.

The two forms should be distinguished in all future records, and earlier records should be re-examined.

DISTRIBUTION (*kergueleni* sensu lato). Kerguelen; 'Gauss' winter station; Ross Sea; South Georgia; New Zealand.

Tryphosa major, n.sp. (Fig. 14).

Occurrence: 1. St. 159. South Georgia. 4 ♀♀ 16–21 mm., 3 ovig. ♀♀ 18–22 mm.
2. St. 170. South Shetlands. 2 ♂♂ 14 mm., 1 ♀ 14 mm., 1 ovig. ♀ about 20 mm. (mutilated). *Types.*
3. St. 175. South Shetlands. 3 ♀♀ 12, 13, 16 mm.

DESCRIPTION. Closely resembling the typical form of *kergueleni* in pleon segments 3 and 4, but apparently a larger species. In other respects generally resembling *kergueleni* but inner lobe of maxilla 1 with six plumose spine setae, and epistome produced in a convex, but somewhat flattened lamina from between the bases of the 2nd antennae to the upper lip.

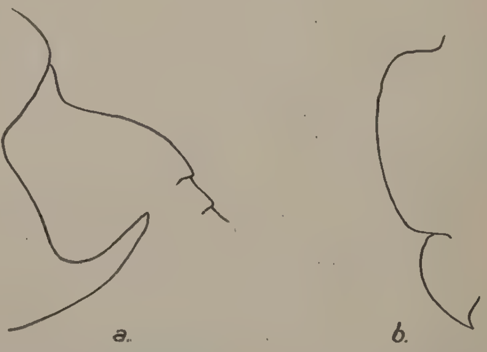

Fig. 14. *Tryphosa major*, n.sp. *a.* Pleon segments 3 and 4. *b.* Profile of epistome and upper lip.

Tryphosa adarei, Wlkr. (Fig. 15).

Walker, 1903, p. 49, pl. viii, figs. 38–44.
Barnard, 1930, p. 326.

Occurrence: St. 175. South Shetlands. 2 ♂♂ 15 and 21 mm., 1 ♀ 14 mm., 4 immat. 10–12 mm.

REMARKS. Pleon segment 3 with postero-inferior angle quadrate; segment 4 with the dorsal carina rounded. Epistome and upper lip forming an arcuate profile as in Schellenberg's fig. 16 (1926) of *murrayi*. Gnathopod 1, 6th joint subequal to upper margin of 5th. Gnathopod 2, 6th joint nearly as long as hind margin of 5th. Telson elongate, tapering.

T. murrayi, Wlkr. 1907, and *T. murrayi*, Schell. 1926, both appear to be composite species. The variation mentioned by Walker (1907, p. 16) should be tested to see whether it is really a case of variation or whether two or more species have not been united. The original description of *adarei* made no mention of the epistome, and this feature also requires examination in the type material. Here, as in the Terra Nova Report, I regard *murrayi* as a perfectly distinct species. Chilton's (1912) and Schellenberg's (1926) records therefore do not apply; and in the Terra Nova Report the reference to Schellenberg and the Gauss locality should be deleted.

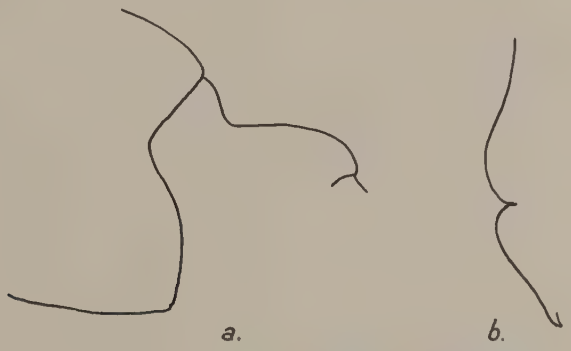

Fig. 15. *Tryphosa adarei*, Wlkr. *a*. Pleon segments 3 and 4. *b*. Profile of epistome and upper lip.

It is curious that this species was only taken once by the 'Discovery.'

DISTRIBUTION. Ross Sea.

Tryphosa triangularis, n.sp. (Fig. 16).

Occurrence: 1. St. 140. South Georgia. 1 ♂, 1 immat. ♀ 9 mm.
2. St. 141. South Georgia. 1 ♂ 9 mm., 1 ♀ 10 mm., 4 ovig. ♀♀ 9–12 mm.
3. St. 144. South Georgia. 2 ovig. ♀♀ 11 mm., 1 immat. 7·5 mm.
4. St. 145. South Georgia. 7 ♀♀ 9–11 mm., 4 ovig. ♀♀ 10–12 mm.
5. St. 159. South Georgia. 11 ♀♀, with ova and embryos, 10–11 mm. *Types*.
6. St. WS 25. South Georgia. 3 ♀♀ 9–10 mm., 1 juv. 5 mm.

DESCRIPTION. The distinctive features of this species are: antero-lateral angle of head acute, reaching three-quarters the length of 1st joint of antenna 1; eyes invisible; pleon segment 3 with the lower margin and the slightly convex hind margin meeting in an angle less than 90°, the corner rounded (cf. Schellenberg's fig. 16 *b* for *murrayi*); segment 4 with a triangular carina, the posterior margin falling away steeply but obliquely; side-plate 1 produced forwards and narrowed below, subtriangular or slipper-shaped (cf. *adarei*); epistome produced in a triangular projection above the upper lip; gnathopod 1 rather slender, as in *adarei*; uropod 3 with inner ramus as long as 1st joint of outer ramus, both rami spinulose, without plumose setae; telson ovate, about half as long again as wide, each lobe with two apical and two lateral spines.

REMARKS. This appears to be a close ally of *trigonica* and *adarei*, but pleon segment 3 and the epistome are distinctive; the carina on segment 4 is not symmetrical as in *trigonica*. Possibly some of the specimens attributed to *murrayi* by Schellenberg (1926, fig. 16 *b*) should belong here.

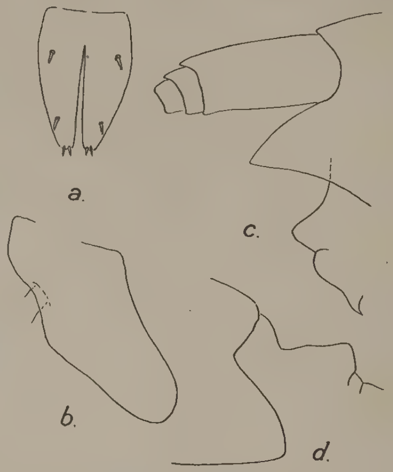

Fig. 16. *Tryphosa triangularis*, n.sp. *a*. Telson. *b*. Side-plate 1. *c*. Anterior margin of head with peduncle of antenna 1, and epistome and upper lip. *d*. Pleon segments 3 and 4.

The specific name refers to the likeness to *trigonica* and to the shape of the epistome.

Tryphosa analogica, n.sp. (Fig. 17).

Cf. *T. serrata*, Schellenberg, 1931, p. 34, figs. 15, 16.

Occurrence: 1. St. 144. South Georgia. 2 ovig. ♀♀ 12 and 15 mm., 1 juv. 6 mm.
2. St. 156. South Georgia. 3 ♀♀ 10–13 mm.
3. St. 159. South Georgia. 1 ovig. ♀ 12 mm.
4. St. WS 25. South Georgia. 1 ♂ 14 mm., 1 ♀ 14 mm., 2 ovig. ♀♀ 16–17 mm. *Types*.

DESCRIPTION. Antero-lateral angle of head pointed, but not very acute, reaching three-quarters the length of 1st joint of antenna 1. Eyes invisible. Pleon segment 3 with postero-inferior corner produced in a rounded, serrate lobe; segment 4 with a strong subtriangular carina, rounded at apex, posterior margin vertical. Side-plate 1 slightly but distinctly narrowed distally. Epistome produced in a broadly rounded lobe above the upper lip. Gnathopod 1 slender. Peraeopods 3–5 with 2nd joint feebly notched on hind margin. Telson twice as long as wide, each lobe with three lateral and two apical spines.

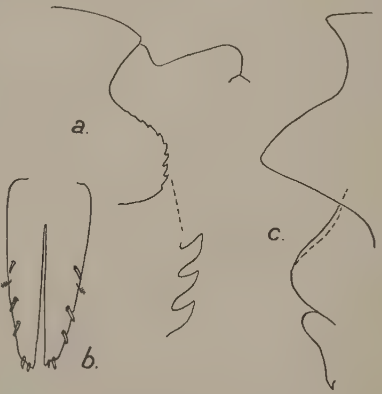

Fig. 17. *Tryphosa analogica*, n.sp. *a*. Pleon segments 3 and 4, with serration further enlarged. *b*. Telson. *c*. Anterior margin of head with epistome and upper lip (the dotted line indicates a slight variation found in some specimens).

Remarks. A casual glance at the serrate pleon segment 3 might lead one to expect that this form was *Tryphosites chevreuxi*, but the epistome is distinctive. The serrations on pleon segment 3 and on the 2nd joints of peraeopods 3–5 are less strong than in the latter species, the carina on pleon segment 4 is more prominent, and the telson longer.

Tryphosa castellata, n.sp. (Fig. 18).

Occurrence: St. 222. Cape Horn. 2 ovig. ♀♀ 11·5–12 mm.

Description. Close to *analogica*, but easily distinguished by the bluntly rounded antero-lateral angle of head, the more narrowly rounded and less prominent epistome, the distally widened 1st side-plate, stouter 1st gnathopod, the low rounded carina on pleon segment 4, and the less produced postero-inferior angle of pleon segment 3, with its fewer and squarer denticles.

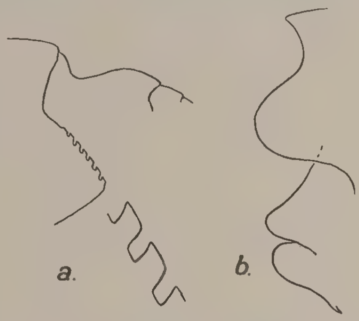

Fig. 18. *Tryphosa castellata*, n.sp. *a*. Pleon segments 3 and 4 with serration further enlarged. *b*. Anterior margin of head with epistome and upper lip.

Tryphosa onconotus, Stebb.

Stebbing, 1908 (*Ann. S. Afr. Mus.*, vi), p. 65, pl. xxxv.
Schellenberg, 1926, p. 276, fig. 20 (juv.); 1926 *b*, p. 219.

Occurrence: St. 91. South Africa. 2 ♂♂ 5 mm., 5 ♀♀ 4–5·5 mm. (all immat.).

Remarks. Schellenberg is quite right in suggesting that the acute point on the postero-inferior angle of pleon segment 3 is characteristic of the young. In half-grown specimens it still remains as a minute blunt and obscure point, but in the adult, as in Stebbing's figure, there is no trace of it.

The original specimens did not come from "False Bay" as Schellenberg (1926) states, but from off the west coast of the Cape Peninsula.

The species is evidently a cold-water form; its occurrence in False Bay does not disprove this statement, as cold currents frequently round the Cape of Good Hope and enter False Bay. It is possible that this species migrates in from the outer waters with these currents; both the present record and the 'Gauss' specimens were taken in winter (September and July respectively). The surface temperatures in Table Bay and False Bay differ but little at this season (cf. Gilchrist, 1902, *Mar. Invest. S. Afr.*, i, p. 203, pl. vi).

Distribution. South Africa, off Table Bay, 448 m.; Simons Bay, littoral; off west slope of Agulhas Bank, 564 m. Also specimens in the South African Museum from off Saldanha Bay, 87 fathoms.

Genus **Tryphosites**, Sars.

Stebbing, 1906, p. 77; 1914, p. 355.
Sexton, 1911 (*Ann. Mag. Nat. Hist.*, ser. 8, vol. VII), p. 510.

The genus is characterized by the prominent spiniform process of the epistome. It includes the northern *longipes* (Bate and Westw.) with a strong upturned point on the postero-inferior angle of pleon segment 3, and *alleni*, Sext., with two points, *stebbingi* (Wlkr.) from Cape Adare and Coats Land,[1] with a short point, and *chevreuxi* Stebb. with the lower hind margin strongly serrate.

Tryphosites chevreuxi, Stebb. (Fig. 19).

Stebbing, 1914, p. 355, pl. iii.

Occurrence:
1. St. 51. Falkland Islands. 1 ♂ 7·5 mm., 2 ♀♀ 8–9 mm., 1 juv. 6 mm., from kelp root.
2. St. 222. Cape Horn. 1 juv. 7 mm.
3. St. WS 71. Falkland Islands. 3 ♀♀ (1 ovig.) 12–13 mm.
4. St. WS 92. Between Falkland Islands and South America. 1 ♀ 8 mm., 2 immat. 7 mm.

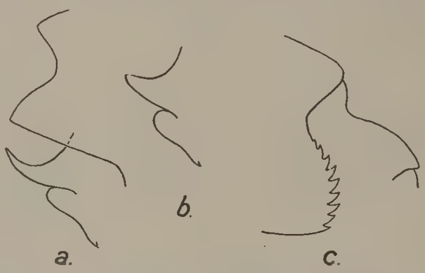

Fig. 19. *Tryphosites chevreuxi*, Stebb. *a*. Anterior margin of head with epistome and upper lip. *b*. Variation of epistome. *c*. Pleon segments 3 and 4.

REMARKS. Antenna 1 in ♀, flagellum 14-jointed, accessory flagellum 5-jointed. Antenna 2, flagellum 14-jointed. Side-plate 1 slightly narrowed, or at least not widened, below. Telson more tapering than in Stebbing's figure, with narrower subacute apices, each lobe with two apical and two lateral spines. The epistomal process is more upturned and falciform than in *longipes*. A single accessory branchia on both segments 5 and 6.

DISTRIBUTION. Falkland Islands, 8 fathoms.

Genus **Tmetonyx**, Stebb.

Stebbing, 1906, pp. 73, 720.
Schellenberg, 1926, p. 278; 1931, p. 40.

T. stebbingi (Wlkr.) must be transferred to the genus *Tryphosites* as Chilton (1912) has shown, owing to its having the epistome produced in a long acute process. The only other austral representatives are *miersi* from Australia, the Kerguelen species *cicadoides* Stebb., and the Antarctic ('Gauss' winter station) species *cicadopsis* Schell.

The following species is very closely allied to the last-mentioned.

Tmetonyx longitelson, n.sp. (Fig. 20).

Occurrence: St. 159. South Georgia. 2 ovig. ♀♀ 15 and 18 mm., 1 ♀ with embryos 15 mm.

DESCRIPTION. Differing from *cicadopsis* as follows: palp of maxilla 1 neither emarginate on outer margin nor serrate on inner margin; postero-inferior angle of pleon segment 3

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[1] In some MS notes on the 'Quest' Expedition, which the late Dr Chilton kindly forwarded to me, this species is recorded from St. 102 off Prince Olaf Station, South Georgia. I have not seen the specimen.

rounded-quadrate (though Schellenberg says the point in his species may be absent); pleon segment 4 with distinct basal indentation and a low keel which overlaps the 5th segment in a rather characteristic manner; telson elongate, at least twice as long as broad, even when pressed flat; inner ramus of uropod 2 not constricted. The antero-lateral angle of the head seems to be shorter and more quadrate (Schellenberg gives no figure); in this respect these specimens are more like *cicadoides* Stebb. (1888, pl. v), but from this species they are easily distinguished by the postero-inferior angle of pleon segment 3.

Side-plate 1 is neither narrowed distally as in *cicadopsis* nor widened as in *cicadoides* (*loc. cit.*, pl. iv), but parallel-sided, rounded below.

The telson and absence of strong upstanding spines on the outer plate of the maxilliped distinguishes this species from *miersi* Stebb.

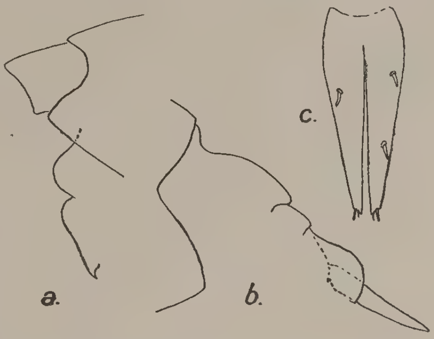

Fig. 20. *Tmetonyx longitelson*, n.sp. *a.* Anterior margin of head with antenna 1, epistome and upper lip. *b.* Pleon segments 3–6 and telson. *c.* Telson.

All the specimens are pale creamy in colour, and there is no trace of eyes.

Tmetonyx carinata (Schell.)

Schellenberg, 1926, p. 271, fig. 18 (*Tryphosa c.*).

Occurrence: St. 170. South Shetlands. 1 ♂ 16 mm.

REMARKS. The triangular process on the upper lip, the character of the 1st gnathopod (simple in ♂, feebly subchelate in ♀, and with a strong tooth on inner margin of finger), and the 2nd maxilla seem to indicate that this species would be better placed in the present genus.

It should be compared with the type of *T. stebbingi* (Wlkr.), the upper lip of which is undescribed.

DISTRIBUTION. 'Gauss' winter station, 385 m.

Genus **Katius**, Chevr.

Chevreux, 1905 (*Bull. Inst. océan. Monaco*, no. 35), p. 1.
Stebbing, 1906, pp. xxi, 721.
Schellenberg, 1927, p. 681.

This genus was originally placed near *Orchomenopsis* and occupies a similar position in the works of Stebbing, Stephensen (1925) and Schellenberg. It seems remarkable that no one has commented upon its extraordinary resemblance to *Eurythenes*. In face of the acceptance of the genus by all authorities it may seem bold to ask what are the characters on which *Katius* is separated from *Eurythenes* and to question the validity of these characters for generic purposes.

A comparison of the descriptions and figures given by Chevreux, Sars (1895, p. 85, pl. xxx) and Schellenberg (1927) shows the following differences: *Katius* has a less prominent epistome, two setae on the inner lobe of maxilla 1 instead of several, shallower side-plates, especially side-plate 2, the hind lobe of side-plate 5 deeper than the anterior lobe instead of *vice versa*, and elongate dactyli on peraeopods 1–5. The first two of these characters can be excluded from the discussion in view of the remarks made below on the Discovery specimens.

On the other hand, there is such an obvious agreement in the mouth-parts and other appendages (*v. infra*) that the differences just mentioned would seem to be specific rather than generic, with the exception perhaps of the dactyli. The enlargement of the dactyli probably indicates a mode of life different from that of *Eurythenes gryllus* (cf. Stephensen, 1915, pp. 37 and 43, and Schellenberg, 1926 *b*, p. 241). I would suggest that this mode of life (in *Katius*) is predaceous on quickly moving animals, rather than semi-parasitic, because the mouth-parts show no trace of degeneration as they do in e.g. *Chevreuxiella*, Steph. If enlarged dactyli be regarded as a generic feature, are *Liljeborgia macronyx*, *Epimeriella macronyx*, *Hyperia macronyx* also to have new generic names created for them? The difference in length of the dactyli in the allied species of these genera may not be as great as that between *Katius* and *Eurythenes*; but that very fact weakens the value of the character for generic purposes.

The physiological argument was used in the Terra Nova Report (1930, p. 346) for splitting up the Iphimediids, but in that case the separation of the genera was made on the mouth-parts, which are not only more important physiologically, but showed far greater morphological differences than the mere difference in the length of the dactyli in *Katius* and *Eurythenes*.

In the present family a great importance—possibly too great an importance—has been attached to the characters of the mouth-parts. Where the characters of the mouth-parts are identical, as in *Eurythenes* and *Katius* (even as regards the character of the spines on the outer lobe of maxilla 1, and the warts along the inner margin of the outer plate of the maxilliped) there would seem to be no question of generic separation on morphological grounds. The branchiae are said to be simple in *Eurythenes*, in *Katius* they are slightly pleated.

Yet it must be admitted that *Katius* has the head curved downwards (cf. Stephensen, 1925, p. 126) and a somewhat inflated and arched peraeon which gives it an appearance not unlike that of a Lanceolid.

Katius obesus, Chevr. (Fig. 21 and Pl. I, fig. 1).

Chevreux, 1905 (*loc. cit.*), p. 1, figs. 1–3.
Stephensen, 1915, p. 37; 1925, p. 126.
Shoemaker, 1920 (*Canad. Arct. Exp.*), p. 8.
Schellenberg, 1927, p. 681, fig. 72; 1931, p. 16.

Occurrence: 1. St. 78. South Atlantic. 1 juv. 16 mm.
2. St. 101. South Africa. 1 ovig. ♀ 42 mm.
3. St. 107. South-east Atlantic. 1 juv. 16 mm., 1 ♂ 25 mm.
4. St. 253. South-east Atlantic. 1 juv. 23 mm. (no penes, no brood lamellae).
5. St. 288. Mid-Atlantic. 1 juv. 23 mm. (no penes, no brood lamellae).

Remarks. Antero-lateral angle of head rounded (but not so blunt as in Chevreux's figure) in the young, becoming subacute in the ♂ and half-grown specimens, and acute in the large ♀. A medio-dorsal keel from peraeon segment 4 to pleon segment 4, stronger posteriorly, and more prominent in adult than young specimens. If the pleon be flexed a basal depression is visible on segments 2–4. The 6th pleon segment bears two dorso-lateral low keels which project as triangular lobes on either side of the base of the telson (cf. Liljeborg, *loc. cit.*, quoted under *Eurythenes*, *infra*, p. 7).

Antero-inferior angle of pleon segment 1 in young rounded, in adult quadrate; postero-inferior angle of segment 2 with a small point; inferior margin of pleon segment 3 convex in young, nearly straight in adult ♀. The antero-inferior angle and margin is feebly costate, and on segments 1 and 2 there is a feeble oblique keel.

The epistome is considerably more prominent than described by Chevreux, and in fact does not differ essentially from that of *Eurythenes gryllus* (Sars, 1895, pl. xxx).

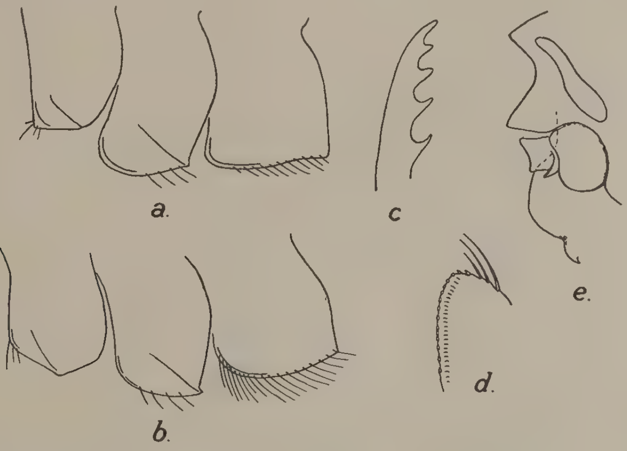

Fig. 21. *Katius obesus*, Chevr. *a*. Pleurae of pleon segments 1–3, adult ♀ (St. 101). *b*. The same, juvenile (St. 78). *c*. Spine from apex of outer lobe of maxilla 1. *d*. Apex of outer plate of maxilliped. *e*. Anterior margin of head with basal joints of antenna 2, epistome and upper lip.

Basal joint of antenna 2 large, bulbous, visible externally (as in *Eurythenes*). Maxilla 1, outer lobe with spines which bear acute and rather widely spaced denticles (as in *Eurythenes*), inner lobe with 2–4 plumose setae in young, five in adult. Maxilliped, outer plate with minute wart-like spinules on inner margin (as described by Schellenberg for *Eurythenes*, 1927, p. 678), 2–3 more obviously spiniform ones distally, and 2–3 plumose setae on outer distal margin.

Branchiae with moderate folds, seemingly indicated in Chevreux's fig. 3 *C*, but not mentioned in his text. Arising from near the base of each branchia on segments 2–7 posteriorly and externally is a small irregularly triangular accessory lobe.

After the above remarks there would seem to be no need to harp further on the similarity of *Katius* to *Eurythenes*. Besides the dactyli of peraeopods 1–5 and the side-plates, a further difference may exist in the branchiae, but Liljeborg's statement (*loc. cit.* under *Eurythenes*, p. 6) ought to be confirmed.

The ovigerous ♀ (St. 101) seems to be the largest and the only adult specimen yet captured. The 'Ingolf' took a specimen about 33 mm. in length with small brood lamellae.

A coloured sketch of this large ♀ was taken at the time and is here reproduced. The colour of no. 1 was noted as "white with pale brown eyes; hepatic and other internal organs visible as a grey mass".

The occurrence of this species in the Southern Atlantic has not hitherto been recorded, except by Schellenberg, 1931.

DISTRIBUTION. North Atlantic: Davis Strait to Azores (about 65° N–36° N); North Pacific, 0–3000 m.

Genus **Eurythenes**, S. I. Smith.

Liljeborg, 1865 (*N. Act. Soc. Upsala*, ser. 3, VI, p. 11; or *Arsskr. Kong. Univ.*, p. 6) (*Eurytenes*, preocc.).
Sars, 1895, p. 85 (*Euryporeia*).
Chevreux, 1900, p. 24 (*Euryporeia*).
Stebbing, 1906, p. 72 (references).
Schellenberg, 1927, p. 678.

As Chevreux remarks, Smith in changing the preoccupied *Eurytenes* into *Eurythenes* altered the spelling though not the sound in languages where "h" is silent. Relaxation of the nomenclatorial rules in favour of Sars' name would set a precedent which might have far-reaching consequences in these days of linguistic aspirations.

The following discussion centres around the magnificent Amphipod collected by d'Orbigny in the stomach of a fish caught near Cape Horn and described by M. Edwards as *Lysianassa magellanica*. Liljeborg (*loc. cit.*) on receiving three large Amphipods taken from the stomach of *Scymnus borealis* at Hammerfest, came to the conclusion that they were identical with the Antarctic form, and gave a description of them under the name *Eurytenes magellanicus*. The Arctic form, however, had already been described in 1822, and is now known as *Eurythenes gryllus* (Licht.).

In 1865 Bate (*Zool. Rec.*, II, p. 331) criticized Liljeborg's opinion as to the identity of the Arctic and Antarctic forms, pointed out several differences, and maintained the accuracy of his description and figure of *magellanicus* in the British Museum Catalogue (1862, p. 66, pl. x, fig. 5).

No great significance attaches to the differences mentioned by Bate, though we may note that the depth of the peraeon is one character which distinguishes *Eurythenes* from *Katius* (cf. *supra*). But Bate himself seems to have fallen into an error, for he uses the words (*loc. cit.*, 1865, p. 332) "*Lysianassa magellanica*, with its squamiform, undivided telson...", and adduces this as the final argument why *magellanica* cannot be put into the genus "*Anonyx*" from which he says he cannot distinguish Liljeborg's genus *Eurytenes*. He claims (1865, p. 331) to have seen the type specimen and from it to have made small corrections in the figure given in 1862. Yet M. Edwards in his original description distinctly states "deux appendices styliformes...représentent le septième anneau" (cf. *infra*).

I think we may safely rely on M. Edwards' statement, and the conclusion is not too hazardous that *magellanica* is a *Eurythenes*. But the validity of the species must be tested by a comparison of the type, if extant, with actual specimens of *gryllus*.

I am indebted to Prof. Gravier of the Paris Museum for the information that, though there is a specimen of *Lysianassa magellanica* in poor condition in the Paris Museum, he very much doubts whether it is the type specimen studied by M. Edwards.

As regards *gryllus*, the descriptions are not too clear on all points. Stebbing's diagnosis (1906) includes the contradictory statements of Sars and Liljeborg, and also a further statement about certain segments of the peraeon and pleon. Schellenberg (1927, p. 679) has introduced a further complication by stating that the last peraeon segment and the five following (pleon) segments have a low longitudinal groove (Rinne). Obviously one and the same segment cannot be both dorsally rounded and keeled, or both grooved and keeled. *Eurythenes gryllus* is worthy of a fuller description based on as much material as possible; there are already quite a number of specimens in European Museums (Stephensen, 1925, p. 110).

One difference in the published figures may be noted here. Liljeborg (*loc. cit.*, figs. 1 and 22) shows the 2nd pleon segment with the postero-inferior angle produced as a distinct point, from which arises an oblique keel. Sars (1895, pl. xxx) shows scarcely any point on the broadly rounded postero-inferior angle.

Though the Magellanic species must remain for the present *sub judice*, it may be useful to quote here M. Edwards' original description.

Eurythenes magellanicus (M. Edw.).

M. Edwards, 1848 (*Ann. Sci. Nat. Hist.*, ser. 3, zool. ix), p. 398.
Lucas, 1857 (*Anim. nouv. Austr. l'Amer. du Sud. Entomol.*), p. 13, pl. i, fig. 3.
Bate, 1862, p. 66, pl. x, fig. 5 (traced from Lucas' figure and corrected from the type specimen).
? *non* Liljeborg, *loc. cit. supra.*

"L'ordre des Crustacés amphipodes n'est représenté jusqu'ici dans nos collections que par des animaux de très petite taille, tels que les Orchesties, les Talitres et les Crevettes de nos côtes; mais il existe dans l'océan Antarctique une espèce de Lysianasse qui est presque aussi grande que les Écrevisses ordinaires de nos rivières. Cet Amphipode remarquable a été trouvé par M. d'Orbigny dans l'estomac d'un Poisson pêché près du Cap Horn, et fait partie des collections déposées par ce voyageur dans notre Museum national. La forme générale de ce Crustacé est trapue; la tête petite, et garnie en avant de lobes jugaux qui s'avancent entre la base des antennes supérieures et inférieures. Les antennes de la seconde paire sont grêles, sans poils ni cupules, et atteignent le quatrième anneau du thorax lorsqu'elles sont reployées en arrière. Les pattes antérieures sont très courtes; celles de la deuxième paire sont longues, très grêles, et terminées par une petite griffe pointue. Les pattes des trois dernières paires sont très petites et subdenticulées sur les bords. Enfin l'abdomen est caréné en dessus, et le sixième anneau de cette portion du corps présente sur sa face dorsale deux fortes crêtes terminées en forme de dent; deux appendices styliformes très forts représentent le septième anneau. La longeur du corps est de 9 centimètres, et la hauteur 3 centimètres. Dans la galerie du Museum, nous avons désigné cet Amphipode sous le nom de *Lysianassa magellanica*."

Genus **Lepidepecreum**, B. and W.

Stebbing, 1906, p. 78.
Stephensen, 1925, p. 117.

Lepidepecreum cingulatum, n.sp. (Fig. 22).

Occurrence: St. 165. South Orkneys. 4 ♀♀ (2 ovig.) 7–7·5 mm., from stomach of *Notothenia*.

Description. Integument not strongly indurated (as preserved). Head with ocular angle almost rectangular, post-antennal angle obtusely quadrate. Eyes oval-reniform. Peraeon and pleon dorsally rounded, not at all carinate, and without any processes. Side-plates 1–4 deep, lower margins almost straight, and together forming an even line; excavation on 4 nearly rectangular, long (dorso-ventrally) but shallow; 5th deep, shallowly bilobed, posterior lobe slightly deeper and larger than anterior, 6th similar, 7th deeper than long, rounded below. Postero-inferior angle of pleon segment 1 rounded, of 2 quadrate, of 3 somewhat produced in an angle less than 90°, lower and hind margins almost straight. Telson longer than broad, cleft almost to centre, lobes apically subacute, each with one stout spine.

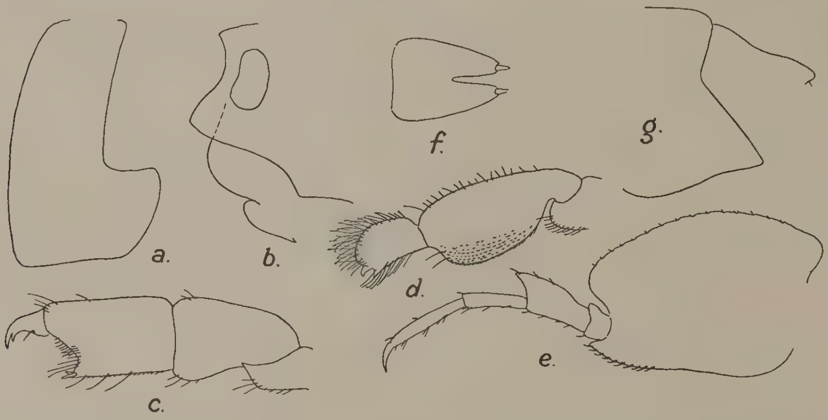

Fig. 22. *Lepidepecreum cingulatum*, n.sp. *a*. Side-plate 4. *b*. Anterior margin of head with epistome and upper lip. *c*. Gnathopod 1. *d*. Gnathopod 2. *e*. Peraeopod 5. *f*. Telson. *g*. Pleon segments 3 and 4.

Antenna 1, 1st joint carinate on dorsal edge, but not apically produced, flagellum 11–12-jointed, accessory flagellum 5-jointed. Antenna 2, flagellum 13–14-jointed.

Epistome and mouth-parts as figured for *umbo* (Sars, pl. xxxix, fig. 2) including the short stout spinules along inner margin of outer plate of maxilliped.

Gnathopod 1 as in *umbo*, 2nd joint long, setose on front margin; but 5th and 6th joints stouter, the defining angle of concave palm more produced. Gnathopod 2 also as in *umbo*, but 6th joint more broadly oval, and chela minute.

Peraeopods 1 and 2 slender. Peraeopods 3–5, 2nd joints ovately expanded, lower hind angle rounded, hind margin obscurely crenulate, 4th joints moderately expanded, 5th abruptly narrower.

Uropods 1–3 extending back about equally, the inner ramus in each slightly shorter than outer ramus.

Colour (as preserved) pale yellowish, with a greyish transverse band on each segment from peraeon segment 1 to pleon segment 5, extending on peraeon segments 1–5 only to the upper parts of the side-plates; eyes black.

REMARKS. The resemblances of this form to *umbo* as regards the mouth-parts and 1st gnathopod appear to outweigh the absence of features usually found in the members of this genus, such as dorsal processes and the produced apex of the 1st joint of the 1st antenna. The feebly indurated integument may possibly be due to the specimens having been taken from a fish stomach, though they are in excellent condition and not at all mutilated or semi-digested. In *longicorne* there is a very similar segmental arrangement of pigment.

Genus **Lepidepecreella**, Schell.

Schellenberg, 1926, p. 281.
Barnard, 1930, p. 321 (*Paracyclocaris*).
Stephensen, 1931 (*Arkiv Zool.*, XXII), pp. 1, 6.

From the nearly related genera *Lepidepecreum*, *Lepidepecreopsis*, and the new genus described below, this genus is distinguished by the entire telson. The 4th side-plate is received into a definite groove on the 5th side-plate, as in *Waldeckia*.

Lepidepecreella ovalis, n.sp. (Fig. 23).

Occurrence: 1. St. 42. South Georgia. 1 ♀ 8 mm.
2. St. 45. South Georgia. 2 ♀♀ 6·5 and 7 mm. *Types*.
3. St. 140. South Georgia. 2 ♀♀ 7 and 8·5 mm.
4. St. WS 33. South Georgia. 1 ♀ 7 mm., 1 ♀ with embryos 8 mm.

DESCRIPTION. Very close to *ctenophora*, Schell., but distinguished as follows: postero-inferior angle of pleon segment 3 with a tiny upturned acute point followed by a small and feeble semicircular notch (both features obscure in nos. 3 and 4); margin above very minutely and feebly serrulate; telson longer than broad, ovate; uropod 3 with outer ramus half as long as peduncle, inner margin minutely serrulate, 2nd joint minute, inner ramus completely fused with peduncle; rostral process more prominent, extending as far as apex of epistomal projection; tooth on posterior margin of pleon segment 4 higher and more strongly developed. Integument indurated, strongly and closely punctured, especially on pleon segments 1–3.

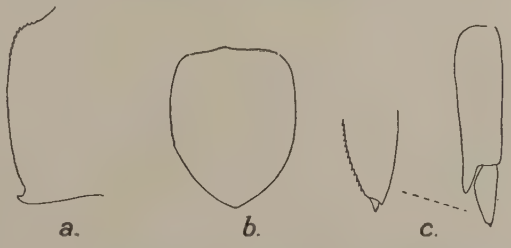

Fig. 23. *Lepidepecreella ovalis*, n.sp. *a*. Pleon segment 3. *b*. Telson. *c*. Uropod 3, with apex of ramus further enlarged.

Remarks. The above distinctive characters seem sufficient to justify a separate species. *L. ctenophora* was obtained by the 'Gauss' at her winter station, approx. 89½° E, 66° S.

Lepidepecreoides, Brnrd.

Barnard, 1931, p. 426.

Integument indurated. Body scarcely carinate anteriorly, but distinctly so posteriorly. Side-plates 1–5 deep; the 5th almost as deep as 4th, solid anteriorly, thin posteriorly, not grooved for reception of 4th; 6th with a rather wide excavation between the anterior and posterior lobes; 7th longer than deep. Telson cleft to base. First joint of antenna 1 not carinate or apically produced. Epistome straight in profile, not expanded; upper lip gibbous. Mandible with palp inserted opposite molar, 2nd joint of palp not very elongate. Lower lip with lobes apically rounded. Gnathopod 1, 6th joint widening slightly distally, palm oblique. Gnathopod 2, 6th joint rather broadly oval, subchelate. Peraeopod 3, 2nd joint abnormally thick, angularly expanded in front and behind. Peraeopods 4 and 5, 2nd joints ovate, not abnormally thick. A single accessory branchia on both segments 5 and 6.

Remarks. From its close allies—*Lepidepecreum*, B. and W., *Lepidepecreopsis*, Steph. 1925, and *Lepidepecreella*, Schell.—this genus is easily distinguished by the unusually great depth of the 5th side-plate, and the unexpanded epistome. The mouth-parts agree with those of *Lepidepecreopsis*, the mandibular palp being inserted much more forward than in the other two genera.

Lepidepecreoides xenopus, Brnrd. (Fig. 24).

Barnard, 1931, p. 426.

Occurrence: 1. St. 177. South Shetlands. 1 ♀ 11 mm.
2. St. 181. Palmer Archipelago. 1 ♂ 9 mm. *Type*.
3. St. WS 33. South Georgia. 1 juv. 4·5 mm.

Description. Integument indurated; when seen by transmitted light it has a honeycomb reticulation, but when seen in an oblique reflected light each hexagonal mark seems to have a raised border so that the integument appears strongly scabrous. Head with antero-lateral angle quadrate. No eyes. Peraeon moderately compressed, scarcely or feebly carinate, but dorsal profile indented at junctions of segments, especially posteriorly. Side-plates deep; 1–4 deeper than their segments, setulose on their anterior margins, 1–3 oblong, with a denticle at postero-inferior angle, 4 also oblong with the whole hind margin excavate for the reception of the deep 5th side-plate, which is very solid in front portion but with a crescentic hollowing posteriorly for reception of 2nd joint of peraeopod 3, hind margin and lower part of anterior margin setulose; side-plate 6 slightly deeper than long, with lower margin excavate between anterior and posterior lobes; side-plate 7 longer than deep, ovoid; hind margins of 6 and 7 setulose. On segments 5, 6 and 7 just above the junction of the side-plates there is a rounded nodulose prominence. Pleon carinate, dorsal profile on each of segments 1–3 undulate, carina ending on segment 3 in a triangular tooth-like projection; segment 4 with a strong slender upstanding tooth; segment 5, very short; postero-inferior angles of segments 1–3 rounded. Segments 1–3 each have a lateral prominence which is rather indefinite, the most projecting part being in line with the prominences on peraeon segments 5–7. Telson twice as long as basal width, cleft to base, lobes tapering to acute apices, each with a terminal spinule.

Antenna 1, peduncle stout but not carinate, the 1st and 2nd joints scabrous, 3rd very short, flagellum 6-jointed, 1st joint large, with regular brush of plumose setae along lower margin, 2nd–6th joints much smaller, accessory flagellum 2-jointed, as long as 1st flagellar joint, 1st joint long, 2nd very short. Antenna 2 slender, 4th and 5th joints subequal, flagellum 7-jointed.

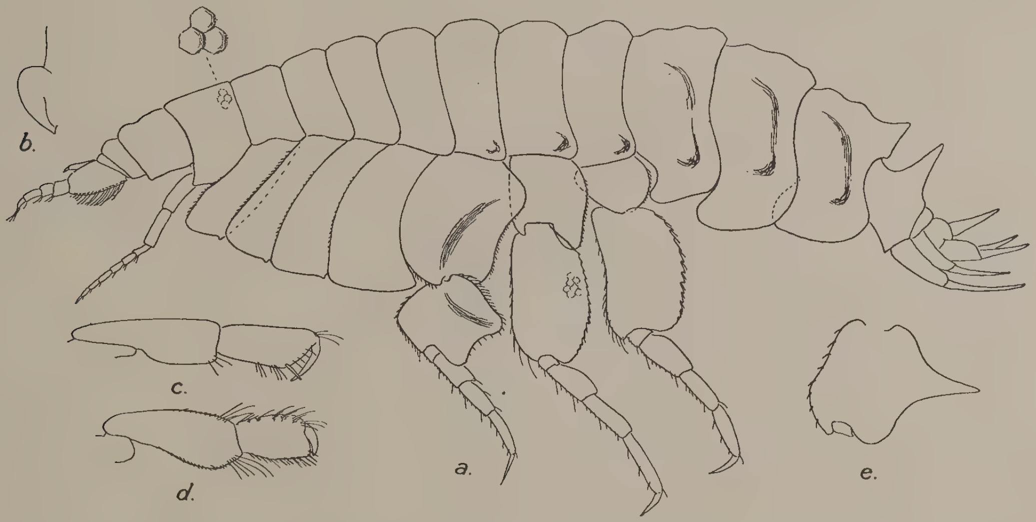

Fig. 24. *Lepidepecreoides xenopus*, Brnrd. *a*. General view, integumentary sculpture indicated on head and peraeopod 4. *b*. Profile of epistome and upper lip. *c*. Gnathopod 1. *d*. Gnathopod 2. *e*. 2nd joint of peraeopod 3 of juvenile (St. WS 33).

Epistome straight in profile, not expanded; upper lip considerably gibbous. Mouthparts as in *Lepidepecreopsis* (Stephensen, 1925, p. 120, fig. 33). Lower lip with lobes apically rounded as in *Lepidepecreum*. Spines on apex of outer plate of maxilla 1 very stout; inner plate with two setae. The short stout spines on apex of palp of maxilla 1 and on inner margin of outer plate of maxilliped very regular, as in Stephensen's figures.

Gnathopod 1 moderately slender; 6th joint about two-thirds length (upper margin) of 5th, widening slightly to the oblique palm, a spine at the defining angle, finger overlapping palm. Gnathopod 2, 6th joint ovoid, broader than in any of the allied genera, palm convex, slightly projecting, but not chelate, finger overlapping palm.

Peraeopods 1 and 2 armed with a few rather long outstanding setae, dactyl elongate, two-thirds length of 6th joint (cf. *Lepidepecreopsis*). Peraeopod 3, 2nd joint remarkably thick, quadrangular, angularly expanded on both anterior and posterior margins, the proximal part of anterior margin with a few spinules, the distal part and the whole posterior margin with short plumose setae, 3rd, 4th and 5th joints also with plumose setae as well as a few longer simple setae, dactyl slender, two-thirds length of 6th joint. In the juvenile the 2nd joint is more oblong than square and the hind margin is produced in a strong straight spine. Peraeopods 4 and 5, 2nd joints not abnormally thick, ovate, hind margin strongly serrate and with short plumose setae, armature of other joints as in peraeopod 3; peraeopod 4 slightly longer than 5.

Uropods 1 and 2, rami subequal, acuminate, sparsely spinose. Uropod 3 extending as far back as uropod 1 and slightly beyond apex of telson, rami lanceolate, 2nd joint of outer ramus well developed, inner margin of both rami with long plumose setae.

A single accessory branchia on both segments 5 and 6.

Remarks. The extraordinarily shaped 2nd joint of peraeopod 3 fits within the hollowed portion of the 5th side-plate when the limb is folded back. The whole animal was covered with very fine particles of foreign matter due to the muddy nature of the bottom; and the setulose margins of the side-plates would seem to be for the purpose of excluding such foreign matter from penetrating between them.

Genus **Allogaussia**, Schell.

Schellenberg, 1926, p. 245.

The first species here described is very like the species of this genus described by Schellenberg, but shows the following peculiarities.

Antenna 1 in both sexes very stout, 2nd joint of peduncle very short compared with its breadth, 3rd easily visible dorsally, but ventrally entirely masked on inner side by the 1st joint of flagellum, which is in continuity with the 2nd peduncular joint. First flagellar joint stout and elongate, 1st joint of accessory flagellum also elongate. Epistome expanding from quite near the bases of 1st antennae into a broad lamina, with a deep narrow notch separating it from the upper lip (the latter feature as in *Allogaussia*). Side-plate 4 fitting into a groove on side-plate 5, thus preventing the 2nd joint of peraeopod 3 from external movement over the posterior lobe of the latter. Uropod 3 extending slightly beyond apices of uropods 1 and 2, well developed, rami with marginal setae. Telson elongate, concave above. Accessory branchiae present on segments 5 and 6.

Accessory branchiae are said to be absent in *Allogaussia paradoxa*, Schell. The mandibular palp is inserted "far behind" (no figure given), and the palp of maxilla 1 in the new species has many more apical spinules than any of the three species described by Schellenberg.

The locking of side-plates 4 and 5 and the confinement of peraeopods 3 and 4 to movement within the side-plates (as in *Waldeckia* and *Kerguelenia*) seems to be a greater specialization than is found in the original three species of this genus, where, according to Schellenberg's figures (1926, figs. 5 and 7), peraeopod 3 is freely movable outside and over the posterior lobe of the 5th side-plate. The epistome, telson and uropod 3 are not so very different, but the 1st antenna is entirely different and in conjunction with the character of the side-plates almost makes a separate genus advisable.

Schellenberg states that *Allogaussia* is near *Orchomenella* though he places it far away in his Gauss Report. He also refers to the likeness and possible identity of his *A. litoralis* (p. 249) with *Orchomenella franklini*, Wlkr. The relationship between both of Walker's species, *pinguides* and *franklini*, and the species of *Allogaussia* seem to be very close, and it is difficult to decide without material of the northern species for comparison whether the former have been rightly referred to *Orchomenella*. Sars' figures of *O. minuta* and *pinguis* (1895, pl. xxiv, figs. 1 and 2), but not of *ciliata* (= *nanus*) and *groenlandica* (pl. xxv, fig. 2 and pl. xxvi, fig. 1), nor Bonnier's figures of *laevis*, show a very definite posterior lobe on the 5th side-plate and also a narrow projecting lobe on the 4th side-plate. Walker's figures of *franklini* (1903, pl. viii, figs. 31 and 35) show the same features and likewise the two species here described.

But in the northern species the 2nd joint of peraeopod 3, though it appears (Sars, pl. xxiv, fig. 1, p^5.) to be confined within the 5th side-plate, is not particularly expanded. Of what generic value are these characters?

The epistome in the original species of *Allogaussia* and of the two here included is not greatly different from that of the typical species of *Orchomenella*. The epistome of Walker's two species is undescribed.[1] If *pinguides* and *franklini* be included in *Allogaussia* on account of peraeopod 3, then the form of telson ceases to be of generic importance, as there are both the short entire form (*paradoxa*) and the long form which may be either notched (*navicula*) or shallowly (*litoralis*) or deeply (*pinguides* and *lobata*) cleft.

Further work on the points here raised is required, including a comparison of the northern and southern species of *Orchomenella*.

Allogaussia navicula, n.sp. (Fig. 25).

Occurrence: 1. St. 170. South Shetlands. 3 ♂♂, 4 ♀♀ 7–8 mm.
2. St. 175. South Shetlands. 2 ♂♂ 8 mm., 2 ♀♀ 8–9 mm. *Types.*

DESCRIPTION. Integument indurated, with scattered punctae. Body distinctly plumper in ♀ than in ♂. Head with antero-lateral angle quadrate, but the actual angle rounded. Eyes large, narrow above, widening below, pale brown or reddish. Peraeon dorsally rounded. Side-plates deep, 1–3 oblong, rounded below, more so in 1 than in 3; 4 narrow, with long but rather shallow excavation, the posterior projection narrow, rounded, fitting into a slight groove on 5, which is ovate, deeper than long with a distinct posterior lobe but no anterior lobe; 6 oblong, the posterior lobe distinct; 7 deeper than long, rounded below. Pleon dorsally rounded, except for a low rounded medio-dorsal keel on segment 4 and 2 dorso-lateral keels on segment 6 projecting as two short rounded lobes on either side of telson; postero-inferior angle of segment 1 rounded, of 2 quadrate, of 3 rounded-quadrate, margin entire. Telson oblong, twice as long as broad, slightly tapering, deeply concave dorsally like a gouge chisel, extending to about middle of rami of uropod 3, apex truncate or slightly emarginate according as it is observed in its natural form or flattened, each apex with a spinule and a setule.

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[1] In the Nimrod specimens of *pinguides* and *franklini* recorded in the Terra Nova Report (1930, p. 448), which certainly seem to agree with Walker's descriptions and figures, the epistome forms a strongly projecting lamina, and side-plate 4 does not fit into a groove in side-plate 5.

Antenna 1 very stout, 1st joint obese, flattened on inside but dorsal margin not sharply keeled, 2nd joint very short, as broad as 1st, 3rd wider dorsally than ventrally, just visible ventrally on outside but on inside entirely masked by the 1st flagellar joint which is thus in continuity with the 2nd peduncular joint (cf. *Kerguelenia antarctica*, Brnrd., 1930, p. 318, fig. 1 *b*); flagellum 10-jointed, 1st joint stout, elongate, strongly setose on inner and lower surfaces, the other nine joints short, accessory flagellum 4-jointed, 1st joint elongate, lying in a groove on 1st flagellar joint, setose on its lower margin. No sexual difference except that there are eight short joints following the large 1st joint in ♀.

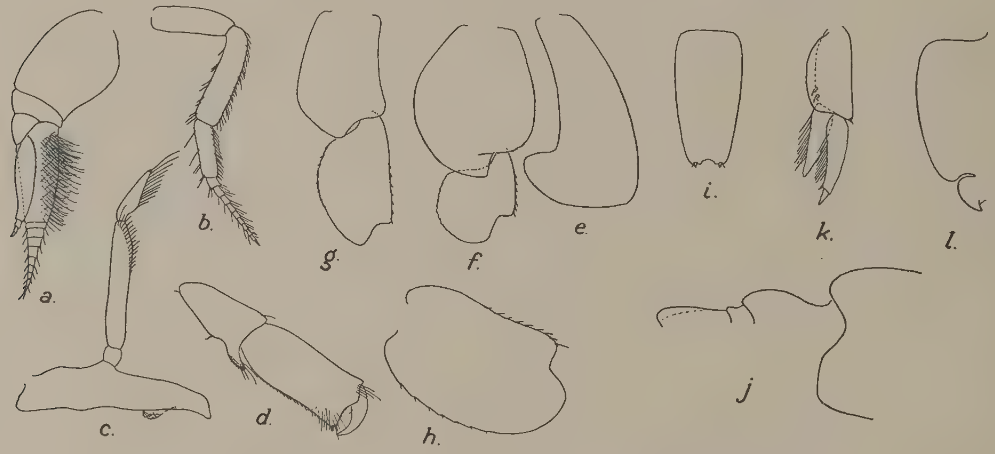

Fig. 25. *Allogaussia navicula*, n.sp. *a*. Antenna 1. *b*. Antenna 2 (3rd peduncular joint onwards). *c*. Mandible. *d*. Gnathopod 1. *e*. Side-plate 4. *f*. Side-plate 5 and 2nd joint of peraeopod 3. *g*. Side-plate 6 and 2nd joint of peraeopod 4. *h*. 2nd joint of peraeopod 5. *i*. Telson. *j*. Pleon segments 3–6. *k*. Uropod 3. *l*, Profile of epistome and upper lip.

Antenna 2 slender, 4th joint longest, 4th and 5th strongly setose on upper margins, flagellum 10-jointed in ♂, 9 in ♀.

Epistome expanding from near bases of 1st antennae into a broad oblong lamina, rounded at upper and lower corners, separated by a deep curved groove from the upper lip, which is gibbous but not projecting beyond the epistome. Mandible, cutting edge somewhat rounded without any denticles, secondary cutting plate and spine row absent, molar well developed, rugulose, palp longer than trunk, inserted about in middle of trunk and behind molar, 2nd joint a little more than twice as long as 3rd, distal half of margin setose, 3rd joint nearly straight, margin setose. Maxilla 1, inner lobe narrow, acuminate, with two feeble apical setules, outer lobe with 8–9 serrate spines, palp extending beyond outer lobe, its truncate apex with 9–10 short stout spinules. Maxilla 2 with both lobes narrow, subequal. Maxilliped, inner plate acuminate, without apical spines, outer plate extending to just beyond apex of 2nd joint of palp, inner margin with crenulations passing into 2–3 separate stout spines on apex, palp 4-jointed, 4th joint slender.

Gnathopod 1 subchelate, 2nd joint straight, setose on anterior margin, 5th rather elongate triangular, lower distal projection narrow, 6th oblong, parallel-sided, twice as long as broad, palm transverse, straight or slightly concave, or even slightly convex, obscurely crenulate, with 1–2 spinules at angle, finger slender, slightly overlapping palm. Gnathopod 2 minutely chelate, 6th joint shorter than 5th, oblong.

Peraeopod 3, 2nd joint subcircularly expanded, hind margin obscurely notched, 4th joint not strongly expanded. Peraeopod 4, 2nd joint ovate, anterior margin straight, hind margin obscurely notched. Peraeopod 5, 2nd joint ovate, but more strongly expanded than in peraeopod 4.

Uropods 1 and 2, rami subequal, acuminate, with a few spinules. Uropod 3 extending slightly beyond apices of uropods 1 and 2, and beyond telson, upper outer margin of peduncle rather expanded, convex, upper inner margin straight, with 2 spinules, inner ramus, which is actually inserted above the outer ramus, as long as 1st joint of outer, inner margins of both with plumose setae in both sexes.

A single elongate accessory branchia on both segments 5 and 6.

Allogaussia lobata, n.sp. (Fig. 26).

Occurrence: 1. St. 142. South Georgia. 1 juv. 5·5 mm.
2. St. 170. South Shetlands. 1 ♀ 13 mm. *Type*.
3. St. 208. South Shetlands. 2 ♀♀ 9–10 mm.

Description. Like *navicula*, but larger. Eyes pale reddish. Side-plates as in *navicula*. Pleon segment 3 very similar to that of *navicula* as regards postero-inferior angle; segment 4 with a more prominent dorsal keel which ends posteriorly in a rounded lobe overlapping segment 5; segment 6 with the dorso-lateral keels on either side of telson more prominent. Telson longer than wide, cleft for two-thirds its length, the lobes dehiscent, each with an apical spinule.

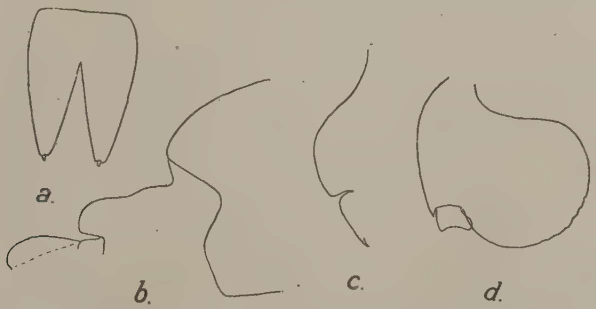

Fig. 26. *Allogaussia lobata*, n.sp. *a*. Telson. *b*. Pleon segments 3–6. *c*. Profile of epistome and upper lip. *d*. 2nd joint of peraeopod 3.

Antennae 1 and 2, and mouth-parts as in *navicula*. Epistome not expanded proximally, its profile sinuous.

Gnathopod 1, palm slightly convex, crenulate.

Peraeopod 3, 2nd joint strongly expanded into a rounded lobe.

In other respects, including presence of an accessory branchia on segments 5 and 6, like *navicula*.

Remarks. Considerably larger than any of the other species (including also *pinguides* and *franklini*). The specific name refers to the 2nd joint of peraeopod 3, the carinae on segments 4 and 6, and the distinct lobes of the telson.

Genus **Orchomenella**, G. O. Sars.

Sars, 1891–95, p. 66, and p. 73 (*Orchomenopsis*).
Stebbing, 1906, p. 81, and p. 83 (*Orchomenopsis*).

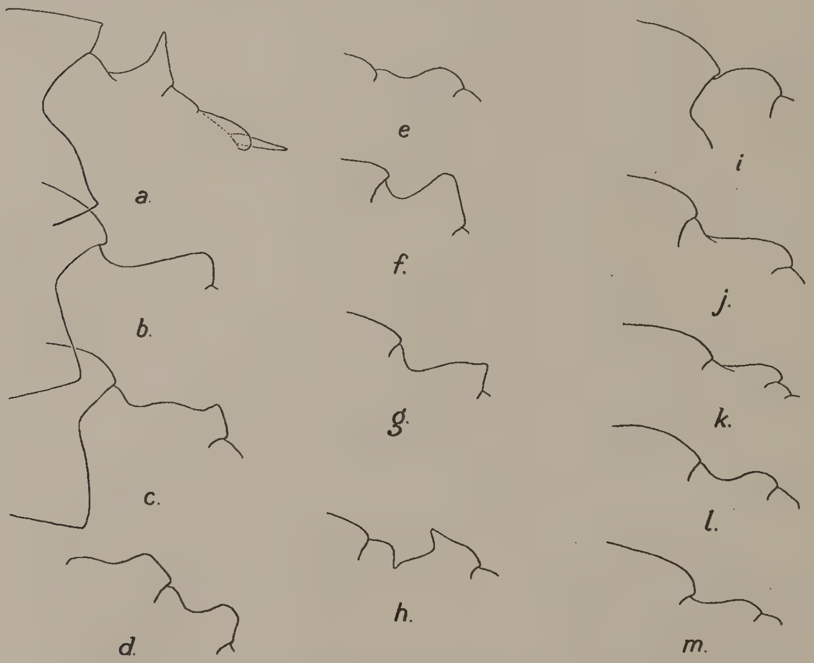

Fig. 27. Dorsal profiles of pleon segments 3 and 4 (also segments 5 and 6 in *a*) of species of *Orchomenella* and *Orchomene*. *a. Orchomenella acanthurus*, Schell. *b. abyssorum* (Stebb.). *c. rotundifrons*, n.sp. *d. macronyx*, Chevr. *e. rossi* (Wlkr.). *f. charcoti* (Chevr.). *g. cavimanus* (Stebb.). *h. zschauii* (Pfr.). *i. nodimanus* (Wlkr.). *j. pinguides*, Wlkr. *k. franklini*, Wlkr. *l. chelipes*, Wlkr. *m. Orchomene goniops*, Wlkr. (Figs. *i–m* are from drawings from the type specimens in the British Museum kindly made by Dr I. Gordon.)

As Stebbing says in his key (1906, p. 11) there are no constant differences between the two genera, and with the discovery that *O. zschauii* possesses a projecting epistome together with the 2nd antennae considerably longer than the 1st antennae, the differences hitherto relied upon are obliterated.

Orchomenella cavimanus (Stebb.) (Fig. 27 *g*).

Stebbing, 1888, p. 679, pl. xxii.
Schellenberg, 1926, p. 285, fig. 25.

Occurrence: 1. St. 51. Falkland Islands. 4 ♂♂ 8 mm., 12 ♀♀ (incl. specimens with ova and embryos) 8–10 mm., 5 juv. 6–7 mm.
2. St. 152. South Georgia. 1 ♀ 10 mm.

REMARKS. Eyes pale brown. Epistome and upper lip as in Stebbing's figure. Pleon segment 4 as in Schellenberg's figure. The 2nd antennae are distinctly longer than the 1st in ♂.

DISTRIBUTION. Kerguelen; 'Gauss' winter station.

Orchomenella abyssorum (Stebb.) (Figs. 27 *b*, 28).

Stebbing, 1888, p. 676, pl. xxi.
Schellenberg, 1926, p. 291, fig. 27 (*chilensis* form *abyssorum*).

Occurrence: St. 208. South Shetlands. 1 ♂ 6·5 mm., 1 ♀ 10 mm.

REMARKS. The stout plates of the 2nd maxilla and the stout outer plate of the 1st maxilla are not at all like those of the typical *Orchomenella* species. The large yellowish brown pear-shaped eyes and other features indicate that these specimens are correctly identified with the Gauss specimens, and also I think with the Challenger type. The characters separating this species from *rossi* are so great that I cannot agree to regarding it as a form of *chilensis*.

DISTRIBUTION. South Atlantic (off Buenos Aires), 3578 m.; 'Gauss' winter station, 385 m.

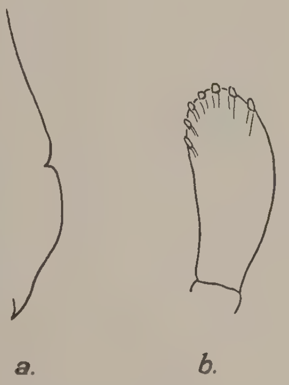

Fig. 28. *Orchomenella abyssorum* (Stebb.). *a*. Profile of epistome and upper lip. *b*. Palp of maxilla 1.

Orchomenella rossi (Wlkr.) (Fig. 27 *e*).

Schellenberg, 1926, p. 288, fig. 26.
Barnard, 1930, p. 327.

Occurrence: 1. St. MS 68. South Georgia. 1 ♂, 1 ♀ 19 mm.
2. St. 39. South Georgia. 2 ovig. ♀♀ 25 and 30 mm.
3. St. 42. South Georgia. Many ♀♀ 17–29 mm., the larger ones ovigerous.
4. St. 45. South Georgia. 6 ♂♂ 17–21 mm., 1 ♀ 19 mm., 4 ovig. ♀♀ 26–28 mm.
5. St. 123. South Georgia. Many ♂♂ and ♀♀ and immat. 15–28 mm., the largest ♀♀ ovigerous.
6. St. 142. South Georgia. 14 ♂♂ 14–21 mm., 7 ♀♀ 17–25 mm., 2 ovig. ♀♀ 23 and 25 mm., 19 juv. 5–12 mm.
7. St. 149. South Georgia. 12 ♂♂ 18–21 mm., 2 ♀♀ 20 and 22 mm., 4 ovig. ♀♀ 25–28 mm.
8. St. 154. South Georgia. 4 ♂♂ 18–20 mm.
9. St. 173. South Shetlands. 1 ovig. ♀ 16 mm.
10. St. 178. Palmer Archipelago. 1 ♂ 15 mm., 2 ♀♀ 14 mm., 2 ovig. ♀♀ 20 and 25 mm.
11. St. 181. Palmer Archipelago. Many ovig. ♀♀ 21–38 mm., comparatively few ♂♂ 17–30 mm., a few juv. 11–15 mm.

12. St. 184. Palmer Archipelago. Many ♂♂, ovig. ♀♀ and immat. up to 25 mm.
13. St. 189. Palmer Archipelago (70 metres). 3 ♂♂ 16–20 mm., 5 ♀♀ 20–27 mm., 1 ovig. ♀ 21 mm.
14. *Ibid.* (7 metres). 3 ♂♂ 20–27 mm., 1 ♀ 31 mm., several juv. 6–13 mm.
15. St. 208. South Shetlands. 2 ovig. ♀♀ 22 and 24 mm.
16. St. WS 38. South Georgia. 1 ♀ 20 mm.

REMARKS. The 1st side-plate is strongly produced forwards, and the lower profile of side-plates 1–4 forms a very even, often slightly concave line.

The colours of nos. 3 and 11 are given as "creamy white with black eyes" and "creamy white, thorax and abdomen scarlet above, eyes black" respectively.

Schellenberg (1926) has uttered a caution against uniting all the various forms of *chilensis* under one name, and has wisely adopted names for the various forms. Being against the principle of a trinomial nomenclature, I should prefer to keep them all as species. But the main point is that all records of *chilensis* should state definitely which form is meant, so that the distribution of each may be determined.

DISTRIBUTION. Ross Sea; 'Gauss' winter station; Palmer Archipelago. Probably also South Orkneys and Coats Land (Chilton, 1912).

Orchomenella charcoti (Chevr.) (Fig. 27 *f*).

Chevreux, 1913, p. 92, figs. 4–6 (*Orchomenopsis c.*).

Occurrence: St. 175. South Shetlands. 1 ♀ with embryos 17 mm.

REMARKS. There is no doubt that this is the form described by Chevreux. The eyes are brown (as preserved), not black as in *rossi*. The palm of the 1st gnathopod is even less obvious than in Chevreux's figure, in fact the 1st gnathopod might almost be described as simple. The finger of the 2nd gnathopod is stronger, and overlaps the minute distal projection of the 6th joint more than in Chevreux's figure. There are two apical spines on each lobe of the telson, but one is not actually apical, but a little subapical (and not symmetrical on the two lobes), and there are 2–3 lateral spines (also not symmetrical). The carina on pleon segment 4 is more obviously triangular than in Chevreux's figure, resembling closely Stebbing's figure of that of *Tryphosa trigonica*. The epistome is straighter and not so prominent as the gently gibbous upper lip.

Although drawn into the synonymy of the polymorphous "species" *chilensis* by Schellenberg, I think this is worthy of specific rank. The 4th pleon segment, gnathopod 1, the flattened or slightly emarginate lower hind margin of the 2nd joint of peraeopod 5 (which feature is also present in the 'Discovery' specimen) and the brown eyes enable it to be picked out at once from specimens of *rossi*.

DISTRIBUTION. Palmer Archipelago.

Orchomenella macronyx, Chevr. (Figs. 27 *d*, 29).

Chevreux, 1906, p. 8, figs. 5–7.
Chilton, 1912, p. 470.
Schellenberg, 1931, p. 43, fig. 22.

Occurrence: 1. St. MS 68. South Georgia. 2 ♂♂ 7–7·5 mm., 2 ♀♀ 9–10 mm., 1 ovig. ♀ 13 mm., 2 juv. 5 mm., from pharynx of Ascidian.
2. St. 39. South Georgia. 1 ♂ 8 mm., 2 ♀♀ 10 mm., 6 ovig. ♀♀ 11–13 mm., 14 juv. 5–6 mm.
3. St. 42. South Georgia. 2 ♀♀ (1 ovig.) 9 mm., 1 juv. 6 mm.
4. St. 45. South Georgia. 59 specimens 5–14 mm., a few ♂♂ and juv. mostly ♀♀ incl. some ovig.
5. St. 123. South Georgia. 3 ♂♂ 7·5–8 mm., 28 ♀♀ (1 ovig.) 9–13 mm., 7 juv. 3–8 mm., from branchial chamber of large Ascidian.
6. St. 149. South Georgia. 1 ♂ 7 mm., 12 ♀♀ 10–12 mm., from branchial chamber of Ascidian.

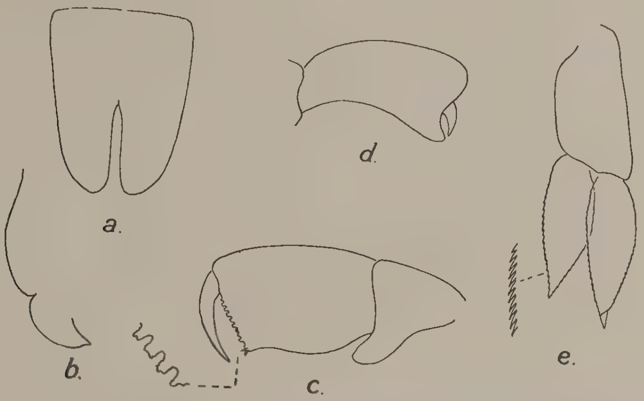

Fig. 29. *Orchomenella macronyx*, Chevr. *a*. Telson. *b*. Profile of epistome and upper lip. *c*. Gnathopod 1, with palmar denticles further enlarged. *d*. Gnathopod 2 (setae omitted). *e*. Uropod 3 with part of margin further enlarged.

Remarks. These specimens are evidently the adults of Chevreux's species. As Chilton remarks in the Scotia specimens, the eye is narrower oval than in Chevreux's figure, and in the adult widens slightly below.

The 4th and 5th side-plates are as figured by Chevreux (fig. 7 *D*, *C*). The transverse depression is present on pleon segment 3, and the profile of segment 4 is quite characteristic. The telson has a narrow slit between the rather broadly rounded lobes, which appear to be quite unarmed.

The 1st joint of antenna 1 is very plump and gives a rounded appearance to the front of the head. Epistome slightly convex, but not prominent.

Gnathopod 1, 6th joint short and stout, palm well developed, transverse, with two small spines at angle and set with a series of little straight processes, some of which are often bifid or fimbriate, with spaces between them. Gnathopod 2, 6th joint oblong, widening distally, minutely chelate, the finger short and stout.

Peraeopod 3, 2nd joint considerably more expanded than in Chevreux's figure. It is not confined within the 5th side-plate, but can move freely outside.

Uropod 3, rami broadly lanceolate, both margins of both rami minutely serrulate. This is a most characteristic feature and serves at once to distinguish the species.

A single accessory branchia on both segments 5 and 6.

Distribution. Palmer Archipelago; South Orkneys.

Orchomenella rotundifrons, n.sp. (Figs. 27 *c*, 30).

Occurrence: St. 174. South Shetlands. 10 ♀♀ (1 ovig.) 11 mm.

Description. Head with lateral angle rounded. Eyes large, oval, widening a little below, black. Pleon segment 3 with postero-inferior angle quadrate, the hind margin slightly convex. Pleon segment 4 with the carina gently convex behind the usual depression, then upturned into a small triangular tooth, the hind margin of which slopes down obliquely (not vertically as in *cavimanus*). Telson about twice as long as wide, cleft for two-thirds its length, lobes slightly dehiscent, each with apical spine and three lateral spines.

Epistome nearly straight, not prominent, upper lip gibbous.

Antenna 1, 1st joint very stout, when folded down giving the front of the head a rounded appearance as in *macronyx*.

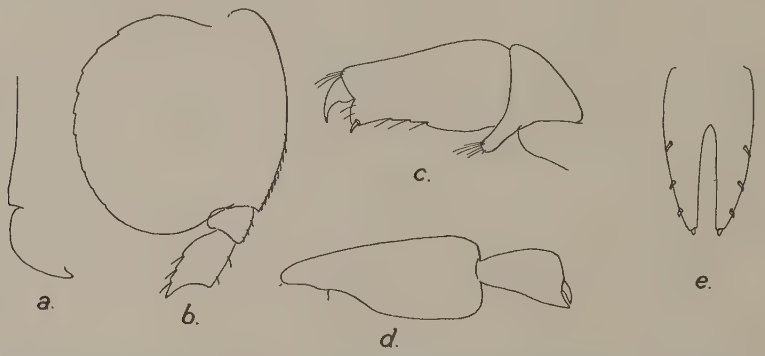

Fig. 30. *Orchomenella rotundifrons*, n.sp. *a*. Profile of epistome and upper lip. *b*. Proximal joints of peraeopod 3. *c*. Gnathopod 1. *d*. Gnathopod 2 (setae omitted). *e*. Telson.

Gnathopod 1, 6th joint stout, narrowing distally, palm short, transverse, gently convex, entire, defined by one spine; finger short, stout, matching or only slightly overlapping palm. Gnathopod 2, 6th joint moderately broad, minutely chelate.

Peraeopod 3, 2nd joint very strongly expanded, subcircular, hind margin slightly serrate.

Uropod 3, inner ramus not reaching the 2nd joint of outer ramus, inner margins of both with plumose setae, outer margins spinose.

Remarks. It seems necessary to institute a new species for these specimens, which will not fit into any of the described ones. They might be referred to *proxima*, Chevr., except that Chevreux does not specially mention the carination on pleon segment 4, comparing his specimens with *obtusa*, Sars, where the carina is of quite a different shape. Moreover the postero-inferior angle of pleon segment 3 is distinctly rounded in *obtusa*.

The objections to referring them to *nodimanus*, Wlkr., are that the hand of gnathopod 1 has no tubercle on the lower margin, and the shape of the carina on pleon segment 4 is quite different (see Fig. 27 *i*).

Orchomenella acanthurus (Schell.) (Figs. 27 *a*, 31).

Schellenberg, 1931, p. 47, fig. 25.

Occurrence: 1. St. 141. South Georgia. 1 ovig. ♀ 10 mm.
2. St. 145. South Georgia. 1 ovig. ♀ 13 mm.
3. St. WS 33. South Georgia. 1 juv. 7 mm.
4. St. MS 62. South Georgia. 2 juv. 5–6 mm.

Description. Body plump. Integument indurated. Head with antero-lateral angle quadrate. Eyes oval, wider below, black. Side-plates deep, one parallel-sided, rounded below, five nearly evenly bilobed, the posterior lobe only a little deeper than anterior, peraeopod 3 therefore freely movable outside the side-plate. Pleon segment 3 with dorsal profile less convex than usual, posteriorly subcarinate, and ending in a square, almost pointed, projection, postero-inferior angle quadrate; segment 4 with a high acute triangular process following the indentation. Telson ovate, scarcely half as long again as wide, cleft for a little over half its length, lobes tapering to acute apices with a spinule in a notch on outside of apex, and three lateral spinules.

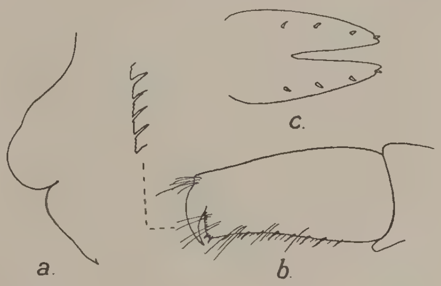

Fig. 31. *Orchomenella acanthurus* (Schell.). *a*. Profile of epistome and upper lip. *b*. Gnathopod 1, with palmar denticles further enlarged. *c*. Telson.

Antenna 1, 1st joint stout, 2nd and 3rd short, flagellum 9-jointed, 1st joint long, accessory flagellum 6-jointed, 1st joint also long. Antenna 2 a little longer than antenna 1, flagellum 13-jointed.

Epistome produced in a broadly rounded lobe projecting beyond the upper lip.

Gnathopod 1, 6th joint distinctly narrowing distally, palm transverse, defined by two spines, its margin with minute squarish denticles, finger overlapping palm. Gnathopod 2, 6th joint minutely chelate.

Second joint in peraeopod 3 broadly expanded, in peraeopod 4 less so, in peraeopod 5 again broadly expanded; hind margins of all feebly notched.

Uropod 3, inner ramus extending to apex of 1st joint of outer ramus, margins of both rami spinulose.

Remarks. An easily recognized species. The carination of the 3rd pleon segment, raised above the insertion of segment 4, is interesting.

Orchomenella zschauii (Pfr.) (Fig. 27 *h*).

Pfeffer, 1888, p. 87, pl. ii, fig. 1.
Stebbing, 1906, p. 85 (part).
Shoemaker, 1914, p. 73.
Schellenberg, 1931, p. 46, fig. 24.

Occurrence: 1. South Georgia. 3. iv. 25. Many ♂♂ and ♀♀ 9–13 mm.
2. East Cumberland Bay, South Georgia. 30. xii. 26. 11–36 m., 2 ♀♀ 9 and 12 mm.

Remarks. The collection of specimens agreeing exactly with Pfeffer's description and figures, and from the same locality, is welcome, as it enables one to vindicate Pfeffer's specific name, and the systematic position assigned to it by Stebbing in 1906, as well as to describe the only two important structural details which Pfeffer omitted to mention. Shoemaker has already reported the species (under the name *Waldeckia zschauii*) from the Bay of Isles, South Georgia, but beyond clearly stating that the specimens agreed with Pfeffer's species and not with Chevreux's *obesa*, he did not further discuss it.

The epistome is distally gibbous, as in Stebbing's figure of that of *cavimanus* (1888, pl. xxii). One of the distinctions between *Orchomenella* and *Orchomenopsis* therefore breaks down.

The 2nd antennae are elongate in the ♂ as described by Pfeffer.

The finger of gnathopod 2, though overlooked by Pfeffer amongst the thick terminal brush of setae, is present; it is rather small and impinges against the slightly projecting lower distal corner of the 6th joint, as it does in *cavimanus*; there is also an indication of the little projecting process or platform figured by Schellenberg (1926, fig. 25 *b*) for the same species, but not so prominent.

This raises the question whether *cavimanus* should not be considered synonymous, as Stebbing himself thought in 1906. Schellenberg, however, maintains *cavimanus* as distinct, and in my opinion he is undoubtedly right. The peculiar shape of the dorsal profile of pleon segment 4 is quite distinctive and constant. A glance at the figures of the two species here given will show that there is no possibility of confusion. In *cavimanus* the highest point of the keel is vertically above the posterior margin of the segment, whereas in *zschauii* it is much more forward.

As Schellenberg (1926) remarks for *cavimanus*, there is a tendency for the branchial lamellae to develop transverse pleats. A single accessory branchia is found on both segments 5 and 6.

The telson is cleft nearly to the base and the lobes though parallel are separated by a narrow space, as in Pfeffer's figure; each lobe has a terminal spinule and two lateral spines.

Distribution. South Georgia. The specimens from Coats Land recorded by Chilton as *Waldeckia zschauii* are not this species but *W. obesa*.

Genus **Pseudorchomene**, Schell.

Schellenberg, 1926, p. 295.

Distinguished by the slender 1st gnathopod.

Pseudorchomene coatsi (Chilton).

Chilton, 1912, p. 477, pl. i, figs. 8, 9 (*Orchomenopsis* ?).
Schellenberg, 1926, p. 295.

Occurrence: 1. St. 41. South Georgia. 1 ♂ 9 mm., 2 ♀♀ (1 ovig.) 13 mm.
2. St. 42. South Georgia. 3 ovig. ♀♀ 12–14 mm.
3. St. 45. South Georgia. 1 ♂ 11 mm., 1 ♀ 13 mm.
4. St. 142. South Georgia. 2 ♂♂ 10–11 mm., 1 ovig. ♀ 13 mm., 7 juv. 5–8 mm.
5. St. 154. South Georgia. 1 ♀ 10 mm.

REMARKS. Both in the dorsal profile of pleon segment 4 and the non-projecting epistome this species resembles *rossi*, but the slender 1st gnathopod and reddish brown eyes at once distinguish it.

A single accessory branchia on both segments 5 and 6.

DISTRIBUTION. Coats Land, 161 fathoms; 'Gauss' winter station, 385 m.

Genus **Pachychelium**, Steph.

Stephensen, 1925, p. 121.
Schellenberg, 1926, p. 296; 1931, p. 18.

To help towards a complete definition of this genus, it may be stated that the mandible has a non-dentate cutting edge, no molar, and a well-developed palp; maxilla 1 bears 3–4 strong teeth on the outer lobe, one spine seta on the inner lobe, and lacks all trace of a palp.

Pachychelium davidis, Steph. (Fig. 32).

Stephensen, 1925, p. 121, fig. 35.
Schellenberg, 1926, p. 296, fig. 30 (*antarcticum*).

Occurrence: 1. St. 39. South Georgia. One specimen 3·5 mm.
2. St. 58. Falklands. One specimen (? ♂) 6 mm.

REMARKS. I was unable to trace any inner plate of the maxilliped such as Schellenberg shows on one side of his fig. 30 *a*. Uropod 3 is exactly as figured by Stephensen for *davidis*, the inner ramus not spine-like as in Schellenberg's figure of *antarcticum*.

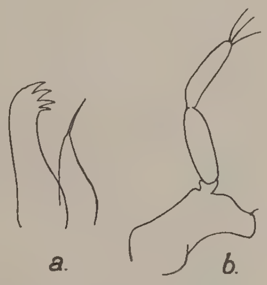

Fig. 32. *Pachychelium davidis*, Steph. *a*. Maxilla 1. *b*. Mandible.

There are 2–3 feeble crenulations, with setules, on the hind margins of side-plates 5–7; Stephensen shows one setule only on side-plate 7. The 1st flagellar joint of antenna 1 is not enlarged or setose as in *davidis*, but like *antarcticum*. Branchial lamellae small, ovate, simple.

I am of opinion that *antarcticum* should be regarded as a synonym of *davidis*, as the shape of the inner ramus of uropod 3 is probably that of the immature form. Cases like this, where the differential features are so minute, are liable to prejudice any discussion of bipolarity. But see Schellenberg, 1931.

Should this prove to be the northern species it would be but a fitting commemoration of the navigator John Davis, who visited the Falkland Islands in 1592, as well as discovering Davis Strait.

DISTRIBUTION. Davis Strait (approx. 66° N, 55° W), 740 m.; 'Gauss' winter station, 385 m.

Family STEGOCEPHALIDAE

Stebbing, 1906, p. 88.
Schellenberg, 1929, p. 196 (key to genera).

Genus **Phippsiella**, Schell.

Schellenberg, 1925 (*Mitt. Zool. Mus. Berlin*, XI), p. 200; 1926 *b*, p. 220; 1929, p. 196.
Stephensen, 1925, p. 130.

In the key (1929) the 2nd joint of peraeopod 6 is said to be expanded in *Stegocephalopsis* but not in *Phippsiella*; this is evidently a typographical transposition. This joint is expanded in *Phippsiella*.

The genus comprises two northern species, and *kergueleni* from the southern hemisphere.

Phippsiella rostrata, n.sp. (Fig. 33).

Occurrence: St. 158. South Georgia. 1 ♂, 2 ♀♀ (1 ovig.) 17–18 mm.

DESCRIPTION. Close to *similis* Sars. Integument indurated, with scattered punctae. Rostrum long, reaching almost to end of peduncle of 1st antenna. Faint indications of ocular pigment, but no lenses. Side-plate 4 received into a slight groove on side-plate 5. Postero-inferior angle of pleon segments 2 and 3 acutely produced, that on segment 2 more so than that on segment 3; margin above on segment 3 smooth. Telson cleft to half its length.

Peraeopods 4 and 5, 2nd joint expanded, hind margin nearly straight in peraeopod 4, convex in peraeopod 5, with feeble and widely-spaced notches, lower hind corner rounded.

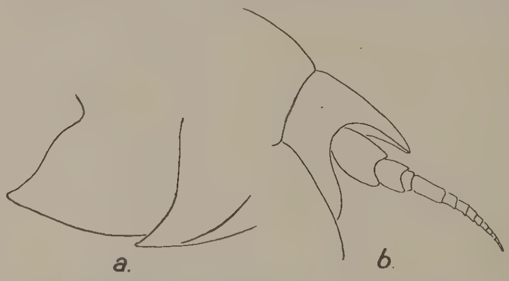

Fig. 33. *Phippsiella rostrata*, n.sp. *a*. Pleon segments 2 and 3. *b*. Head with antenna 1.

Genus **Andaniexis**, Stebb.

Stebbing, 1906, p. 94.

In view of the new species here described Stebbing's diagnosis needs a slight emendation as regards the 2nd gnathopod.

Andaniexis australis, n.sp. (Fig. 34).

Occurrence: 1. St. 87. South-east Atlantic. 4 ♀♀ 4–4·5 mm. *Types.*
2. St. 89. South Africa. 1 ♀ 5 mm.

DESCRIPTION. Resembling *abyssi* (Boeck) except in the following particulars.

Gnathopod 2, 6th joint not very slender, almost as wide and scarcely longer than 5th, and subequal in length to the 6th joint of gnathopod 1; the lower margin has a very slight concavity distally which is defined by a rather long and stout spine against which the finger impinges.

Peraeopods 4 and 5, hind margin of 2nd joint perfectly smooth and entire.

Colour (as preserved) yellowish brown, ocular pigment whitish.

REMARKS. This is a very interesting discovery because it is the first record of the northern genus *Andaniexis* in the southern oceans. Strauss' record is open to doubt as pointed out under *Parandania boecki* (*infra*).

The white patch of ocular pigment is present and even larger apparently than in *abyssi*. In the course of dissection an attempt was made to determine the presence or absence of ocular elements and optic nerve, but for this purpose the preservation is not too good; and in any case sectioning would be the only proper and conclusive method in such a small animal.

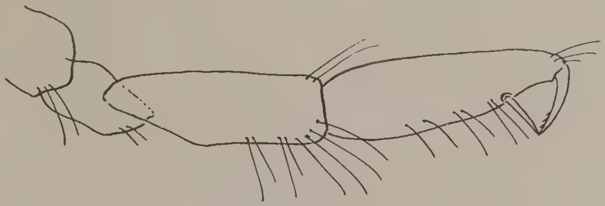

Fig. 34. *Andaniexis australis*, n.sp. Gnathopod 2

Genus **Parandania**, Stebb.

Stebbing, 1906, p. 95.

Parandania boecki (Stebb.) (Fig. 35).

Stebbing, 1888, p. 735, pl. xxxvi.
Chevreux, 1905 (*Bull. Inst. océan. Monaco*, no. 35), p. 7.
Walker, 1909, p. 330.
Barnard, 1916, p. 131.
Schellenberg, 1926, p. 300; 1926 *b*, p. 223, 242, fig. 28 *c*.
Pirlot, 1929 *a*, p. 8.
? Strauss, 1909, p. 78 (*Andaniexis abyssi*, *non* Boeck).

Occurrence: 1. St. 8. South Atlantic. 3 immat. 11–13 mm.
2. St. 9. South Atlantic. 1 ♂ 18 mm., 2 ♀♀ 17–18 mm., 5 immat. 10–11 mm.
3. St. 71. South-west Atlantic. 4 ♂♂ 18–19 mm., 6 ♀♀ 16–25 mm., 1 ♀ with uterine ova 24 mm., 6 immat. 12–14 mm., 14 juv. 4–10 mm.
4. St. 72. South-west Atlantic. 5 ♀♀ 16–20 mm.
5. St. 76. South-west Atlantic. 1 ♂ 19 mm., 2 ♀♀ 22 mm.
6. St. 78. South Atlantic. 1 immat. 14 mm.
7. St. 85. South-east Atlantic. 3 ♀♀ 18 mm., 2 immat. 15 mm.
8. St. 101. South Africa. (1310–1410 m.) 1 ♀ 16 mm.
9. St. 107. South-east Atlantic. 1 ♂ 15 mm., 1 ♀ 22 mm.
10. St. 114. Bouvet Island. 1 ♂ 19 mm., 10 ♀♀ 18–28 mm., 4 juv. 11–15 mm.
11. St. 151. South Georgia. 1 immat. 13 mm.
12. St. 208. South Shetlands. 2 immat. 8 and 15 mm.

13. St. 239. South-west Atlantic. 11 ♂♂ 15–22 mm., 11 ♀♀ 17–24 mm., 1 ♀ with embryos 26 mm., 6 immat. 11–15 mm.
14. St. 253. South-east Atlantic. 1 ♀ 16 mm.
15. St. 256. South-east Atlantic. 1 mutilated, 1 immat. 12 mm.
16. St. 287. Mid-Atlantic. 2 ♂♂ 13 and 14 mm., 1 ♀ 12 mm., 2 juv. 6 and 9 mm.
17. St. 298. Cape Verde. 1 ♀ 16 mm.

DESCRIPTION. The integument is not covered with "hexagonal markings", but is speckled all over with minute points as represented in Stebbing's figure of side-plate 1 (1888, pl. xxxvi, gn_1). Eyes completely obsolete. Side-plate 1 triangular, deeper than its basal length; side-plate 4, 1⅓ times deeper than its greatest length (just below the posterior excavation). Pleon segment 2 with postero-inferior angle quadrate; segment 3 acutely produced.

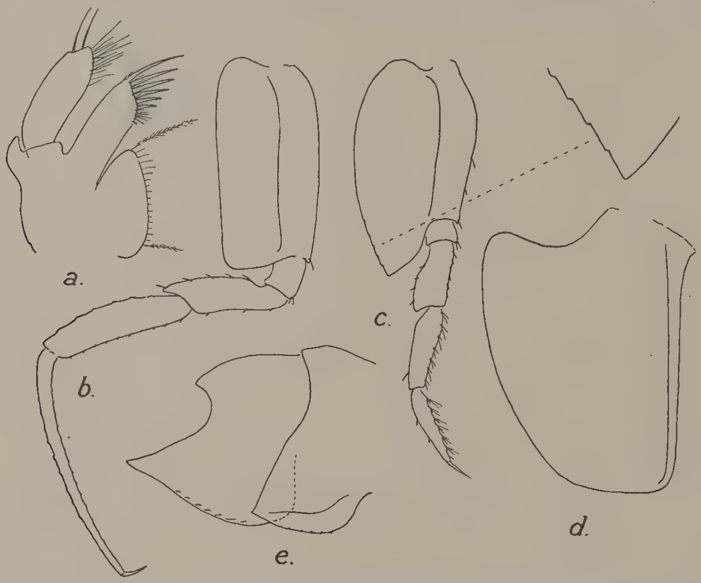

Fig. 35. *Parandania boecki* (Stebb.). *a.* Maxilla 1 (whole inner margin of inner lobe with long plumose setae). *b.* Peraeopod 4. *c.* Peraeopod 5, with lower hind margin of 2nd joint further enlarged. *d.* Side-plate 4. *e.* Pleon segments 2 and 3.

Antenna 1, flagellum about 20-jointed, 1st joint densely setose, accessory flagellum nearly bare, without long terminal setae. Antenna 2, flagellum about 35-jointed.

Epistome carinate. Maxilla 1, with an acute projection on outer side of insertion of palp (probably invisible if the appendage were squashed under a coverslip).

Peraeopods 3 and 4, 6th joint almost equal to 4th and 5th joints together, quite equal if the dactylus be included, slender, minutely spinulose. Peraeopod 5, 2nd joint ovate, anterior margin proximally gibbous, but not strongly so, distal hind angle considerably more pointed than in Stebbing's figure.

Uropods 1 and 2, peduncle carinate on ventral surface. Uropod 3, peduncle carinate on dorsal surface. Both margins of outer ramus and inner margin of inner ramus of uropod 1 minutely serrulate or pectinate; inner margin of outer ramus, and outer margin of inner ramus, in uropods 2 and 3 also minutely serrulate or pectinate.

REMARKS. Although there are a few specimens which exactly fit the Challenger specimen, the great majority differ slightly as regards the characters set out above. The length of the dactyls of peraeopods 3 and 4 is the most noteworthy difference. It seems that the normal form is as here described and that the Challenger specimen was exceptional. The specimens with short dactyls are mostly smaller specimens, but the length of the dactyls is not dependent on growth changes, because quite small specimens (e.g. juveniles of no. 3) have the typical elongate dactyls. Intermediate lengths also occur. Schellenberg (1926 *b*) has figured a peraeopod "6" (= 4) with long dactyl in connection with his remarks on bathypelagic adaptations.

On most occasions hitherto this species has been captured only singly, whereas the 'Discovery' on several occasions has taken it in fair numbers, viz. 15, 29 and 31 at a time.

All the specimens are more or less brown in colour, though some are somewhat bleached. No. 3 is recorded as being "very dark brown", and Note 20 at St. 8 says "jet black in front, abdomen purplish black". The embryos from the brood pouch of no. 13 are white. This brown or blackish colour is found also in *E. gigantea*, *A. abyssi* and other Stegocephalids.

The eyes are completely obsolete. No traces of ocular pigment were visible in any of the specimens, and the optic nerve and ganglion are quite absent. A similar condition was found in the specimens identified by Strauss as *Andaniexis abyssi* (1909, p. 78). I very much doubt this identification; the size, nearly 20 mm., is against their being *A. abyssi*, whereas it is in favour of their being *P. boecki*, which is now known to have a wide distribution in southern waters. Strauss was not a systematist and has perpetrated several synonyms and *nomina nuda*; it is a pity he did not have his specimens properly identified, especially as he has called the stage of complete degeneration of the eye the "Andaniexis" stage. The true *Andaniexis* has at least ocular pigment (Sars, 1895), and so far as we know may still retain rudiments of the visual elements and optic ganglion. A re-examination of Strauss' material is desirable, as Schellenberg has shown in regard to the Gauss and Valdivia collections, which Strauss also worked.

The ♀ with embryos was caught in June, that with uterine ova in May; the Cape ♀ with ova (Barnard, 1916) was caught towards the end of April. The breeding season would thus seem to be autumn and winter in the southern hemisphere.

There is no evidence of a nocturnal upward migration.

Our knowledge of the distribution in the south-westerly portion of the Atlantic has been considerably extended, the most southerly locality being 53° 25′ S off South Georgia, though in the easterly portion of the Atlantic the 'Valdivia' recorded this species from 55° 20′ S.

DISTRIBUTION. North Atlantic (Bay of Biscay to equator); South Atlantic (off Pernambuco and south to 55° S); Indian Ocean; South Africa.

Genus **Euandania**, Stebb.

Stebbing, 1906, p. 97.

Euandania gigantea (Stebb.).

Stebbing, 1888, p. 730, pl. xxxv; 1906, p. 97.
? Walker, 1907, p. 18.

Occurrence: St. 85. South-east Atlantic. 1 ♀ 33 mm.

Remarks. As preserved the integument is very flimsy, and the colour a pale horn colour.

The rami of uropod 3 extend as far as those of uropod 1, and are similar in character.

Walker's record remains unconfirmed; he himself recorded the species with a query, as he did not dissect the specimen.

Distribution. Off Marion Island, 2926–3430 m. McMurdo Sound?

Genus **Andaniotes**, Stebb.

Stebbing, 1906, p. 96.
Barnard, 1930, p. 328.

Andaniotes linearis, n.sp. (Fig. 36).

Occurrence:
1. St. 39. South Georgia. 1 ♀ 7 mm.
2. St. 42. South Georgia. 3 ovig. ♀♀ 5·5–6 mm.
3. St. 144. South Georgia. 2 ♀♀ (1 ovig.) 11 mm.
4. St. 148. South Georgia. 1 ♀ 10 mm.
5. St. 149. South Georgia. 1 ovig. ♀ 11 mm.
6. St. 156. South Georgia. 6 ♀♀ 9–10 mm. (1 with one embryo left in pouch). *Types.*
7. St. 175. South Shetlands. 1 ♀ 9 mm.
8. St. 190. Palmer Archipelago (90–130 m.). 1 ♀ 7·5 mm., 1 ovig. ♀ 8 mm.

Description. Differing from *corpulentus* in its larger size, in the linear 2nd joint of peraeopod 4, the almost smooth hind margin of 2nd joint of peraeopod 5, and the slender evenly tapering 6th joint of gnathopod 2.

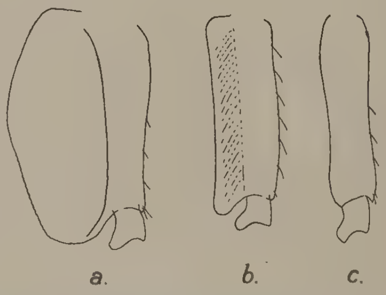

Fig. 36. *Andaniotes linearis*, n.sp. *a*. Peraeopod 5. *b*. Peraeopod 4 (dotted lines indicate a ridge with setae on inner surface). *c*. Peraeopod 3.

From *ingens* it differs in not showing any sign of the degeneration of the palp of maxilla 1 or the palp of the maxilliped, or shortening of the mandibles, being in these respects quite like *corpulentus*.

Remarks. It is possible that the specimens from Port Charcot recorded by Chevreux (1906, p. 22) as *corpulentus*, an Australasian species, should really belong here.

Family AMPELISCIDAE

Stebbing, 1906, p. 97.
Strauss, 1909, pp. 20–36 (eye structure).
Barnard, 1916, p. 132; 1925, p. 335; 1930, p. 329.

Three of the four known genera are now found to be represented in the Antarctic. The South African *Triodos*, Brnrd., was instituted to express the breakdown of the generic definitions which up to that time were clear cut, though *Byblis anisuropus*, Stebb. 1908, showed a slight anomaly. The Antarctic fauna is now shown to possess a *Haploöps* with an expanded 2nd joint in peraeopod 5 as in *Ampelisca* and *Byblis*; the type of a new genus with rather distinctive features of its own, together with characters of *Ampelisca* and *Byblis*; also two forms with simple branchiae, a character which is in conflict with the hitherto accepted definition of the family. Finally, the *Haploöps* which has been brought to light by the 'Discovery' has the lower pair of corneal lenses on the ventral surface of the head, as in *A. hemicryptops* recently described from the Terra Nova collection.

Genus **Ampelisca**, Kröy.

Stebbing, 1906, pp. 98, 721.
Barnard, 1916, p. 132; 1925, p. 335; 1930, p. 329.

Ampelisca eschrichtii, Kröy. (Fig. 37 *a*).

Chevreux, 1906, p. 20, fig. 11; 1913, p. 96.

Occurrence: 1. St. 42. South Georgia. 1 ♀ 24 mm.
2. St. 144. South Georgia. 1 ♂ 22 mm., 2 ovig. ♀♀ 21 and 25 mm., 6 juv. 10–11 mm.
3. St. 180. Palmer Archipelago (160 m.). 3 ♀♀ 20–23 mm.
4. St. 187. Palmer Archipelago. 2 ♀♀ 21 and 23 mm.

REMARKS. On the question of the identity of the northern and southern forms see Chevreux (1906), Chilton (1917, *Journ. Zool. Res.*, XI, p. 75) and Stephensen (1925, p. 140). Stappers and Stephensen are able to distinguish *macrocephala* from *eschrichtii* and these two species are very distinct in Sars' figures. *A fortiori* I fail to see how it is possible to include either *acinaces* or *chiltoni* in *eschrichtii*. The more evenly rounded hind margin of the 2nd joint of peraeopod 5 and the stronger dorsal keel on pleon segment 4 seem to be sufficient to distinguish the southern form, though in the opinion of some authors these may not constitute *specific* characters. I entirely agree with Stephensen, and think that a new name should be found for the southern *eschrichtii*.

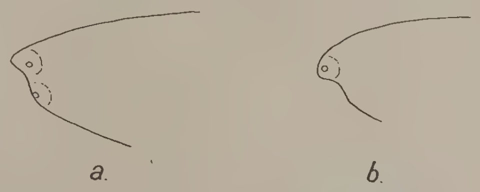

Fig. 37. Outline of head of: *a. Ampelisca eschrichtii*, Kröy.; *b. hemicryptops*, Brnrd.

The 2nd joint of the mandibular palp is linear in the southern as in the northern form.

DISTRIBUTION. Palmer Archipelago, 60–200 m.

Ampelisca macrocephala, Lilj. (Fig. 38).

Walker, 1903, p. 53, pl. ix, figs. 58–61*; 1907, p. 18.
Stebbing, 1914, p. 357.

Occurrence: 1. St. 42. South Georgia. 2 ♂♂, 8 ♀♀ (incl. 4 ovig.) 9–11 mm.
2. St. 123. South Georgia. Many ♂♂, ♀♀, some ovig. 10–11 mm.

Description. Body dorsally compressed, but scarcely keeled except slightly on head. Head moderately deep. Corneal lenses 4, upper in the upper angle of head, lower actually on the lower margin. Postero-inferior angle of pleon segment 3 produced in an acute point, margin above nearly straight; pleon segment 4 with a low triangular ridge dorsally.

Antenna 1 about half length of antenna 2 in ♀, two-thirds in ♂. Antenna 2 extending to about 6th peraeon segment; 4th and 5th peduncular joints subequal.

Mandibular palp with 2nd joint linear, as in the northern *macrocephala*.

Peraeopods 1 and 2, dactyls considerably longer than 5th and 6th joints together. Peraeopod 5, 2nd joint expanded into a nearly evenly rounded lobe, somewhat truncate below, extending to middle of 4th joint, 3rd–6th joints gradually increasing in length, 6th abruptly narrower than 5th, narrow ovate, dactyl shorter than 6th.

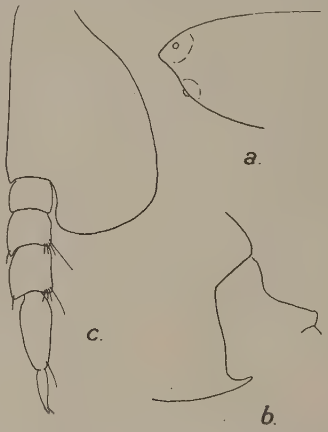

Fig. 38. *Ampelisca macrocephala*, Lilj. *a*. Head. *b*. Pleon segments 3 and 4. *c*. Peraeopod 5 (setae on 2nd joint omitted).

Uropod 3 with rami narrow lanceolate.

Remarks. This form is extraordinarily close to the northern *macrocephala*, Lilj., and *latipes*, Steph., but differs in the almost straight hind margin of pleon segment 3 above the produced point, straighter even than in *latipes*. Gnathopods 1 and 2 are rather stouter than in Sars' figure of *macrocephala* (pl. lx, fig. 1), but gnathopod 1 is not as stout as in *latipes*. Peraeopod 5 is like that of *latipes*. On the whole this form resembles *latipes* more than *macrocephala*. In my opinion this form should be specifically separated from the northern species, as in the case of the two forms of *eschrichtii*.

Distribution. McMurdo Sound; Falkland Islands.

Ampelisca bouvieri, Chevr.

Chevreux, 1913, p. 96, figs. 7–9.

Occurrence: 1. St. 27. South Georgia. 1 ♂ 19 mm., 1 ♀ 26 mm.
2. St. 140. South Georgia. 1 ♀ 20 mm.
3. St. 153. South Georgia. 1 ♀ 22 mm.

Remarks. Chilton (1917, *loc. cit.*, p. 79) in discussing the synonymy of *eschrichtii*, mentioned that Chevreux in describing his species did not point out the special characters distinguishing it. Chilton without critical discussion places it in the synonymy of *eschrichtii*.

From Chevreux's figures it is easy to see that the process on pleon segment 3 is larger than in *eschrichtii*, and the 2nd joint of peraeopod 5 more evenly rounded than in even the Antarctic form of *eschrichtii*. But the most distinctive feature is the shape of the head, which at once distinguishes *bouvieri* from all other Antarctic Ampeliscids except *Haploöps securiger* (*infra*). The 2nd joint of the mandibular palp is linear.

A. bouvieri is undoubtedly a distinct species.

DISTRIBUTION. Palmer Archipelago, 60–70 m.

Ampelisca hemicryptops, Brnrd. (Fig. 37 *b*).

Barnard, 1930, p. 329, fig. 8.

Occurrence: 1. St. 170. South Shetlands. 1 ovig. ♀ 23 mm.
2. St. 175. South Shetlands. 3 ♂♂ 19–22 mm., 2 ♀♀ 22–23 mm., 1 ovig. ♀ 23 mm., 3 juv. 11–13 mm.
3. St. 181. Palmer Archipelago. 1 ♂, 2 ♀♀ 14–15 mm.
4. St. 186. Palmer Archipelago. 1 ♂ 20 mm.
5. St. 187. Palmer Archipelago. 1 ovig. ♀ 21 mm.
6. St. 190. Palmer Archipelago (315 m.). 1 ♀ 21 mm.

REMARKS. Contrary to the Terra Nova specimens, these have the long subapical spine on the outer ramus of uropod 2. The 6th joint of peraeopod 5 is linear. The examination of further specimens shows that there is not the slightest difficulty in distinguishing this species from *eschrichtii* at a first glance. The shape of the head and the position of the upper corneal lens are distinctive, as shown in the figure here given, apart from the position of the lower corneal lens. The position of the latter is quite constant.

DISTRIBUTION. McMurdo Sound, 256–441 m.

Ampelisca bransfieldi, n.sp.

Occurrence: St. 177. South Shetlands. 1 ♂ 19 mm., 1 ♀ 16 mm.

DESCRIPTION. Like *eschrichtii* but without any corneal lenses, or (as preserved) ocular pigment. Head slightly compressed dorsally, but not keeled, about intermediate between *eschrichtii* and *hemicryptops* in this respect. Second joint of mandibular palp linear. Postero-inferior angle of pleon segment 3 more strongly produced than in *eschrichtii*; dorsal carina on segment 4 as in the Antarctic form of *eschrichtii*.

Antennae 1 and 2 subequal, extending to about 4th or 5th peraeon segment. Dactyli of peraeopods 1 and 2 subequal to 5th and 6th joints together. Peraeopod 5, 2nd joint like that of the northern form of *eschrichtii*, i.e. with a distinct subangular bend in hind margin, though the greatest breadth is a little lower, opposite the end of 3rd joint, 5th joint without distal notch on anterior margin, 6th joint subequal to 5th, narrow, sublinear.

REMARKS. The species may be compared with *odontoplax* Sars, though it differs in the more produced postero-inferior angle of pleon segment 3, and the narrower 6th joint of peraeopod 5.

Ampelisca statenensis, n.sp. (Fig. 39).

Occurrence: St. WS 88. Cape Horn. 1 ovig. ♀ 14 mm.

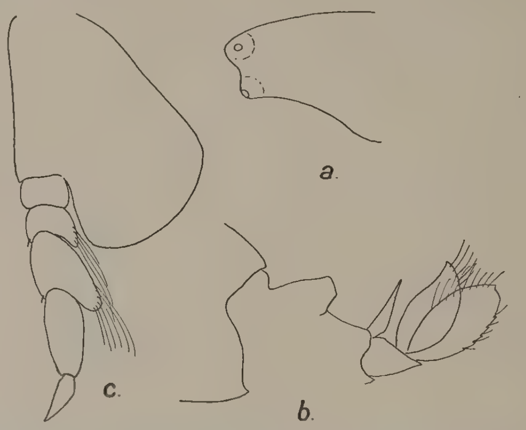

Fig. 39. *Ampelisca statenensis*, n.sp. *a*. Head. *b*. Pleon segments 3–6, with uropod 3. *c*. Peraeopod 5 (setae on 2nd joint omitted).

Description. Body dorsally compressed, with a faint keel from head to pleon segment 3. Head truncate, lower margin concave in front. Corneal lenses 4, the upper in upper angle of head, the lower on the lower margin. Postero-inferior angle of pleon segment 2 rounded, of 3 with a small point; segment 4 with a high, bluntly rounded dorsal keel.

Antenna 1 extending to end of peduncle of antenna 2, and about equal to head plus peraeon segments 1 and 2. Antenna 2 very slender, 5th joint half length of 4th joint, flagellum extending to about 6th peraeon segment. Mandibular palp with linear 2nd joint.

Peraeopods 1 and 2, dactyls longer than 5th and 6th joints together, 4th joint in peraeopod 1 not produced over base of 5th joint. Peraeopod 5, 2nd joint expanded into a subtriangular lobe extending downwards to end of 4th joint, obliquely truncate with hind angle rounded, greatest width opposite base of 3rd joint, 4th slightly longer than 3rd, 5th large, expanded on hinder apex, 6th as long as 5th, ovate, dactyl two-thirds 6th joint.

Uropod 3, rami very broadly laminate, the outer ovate, outer margin spinulose, inner with long plumose setae, inner ramus rather more lanceolate, but with apex truncate, with plumose setae.

Remarks. Somewhat resembling *gibba*, Sars, as regards the dorsal process on pleon segment 4, but more like *latipes*, Steph., as regards peraeopod 5. The 3rd uropods are very large.

Specific name from the locality near Staten Island.

Ampelisca brevicornis, Costa.

Stebbing, 1906, p. 100.
Barnard, 1916, p. 132.
Schellenberg, 1925, p. 130 (formae *dentifera*, *rectangula*, *intermedia* and *platypus*).

Occurrence: St. 91. South Africa. Nine specimens 6–8 mm.

Remarks. These specimens have the high rounded carina on pleon segment 4 and the broadly oval rami of uropod 3 as described by Schellenberg for *dentifera* and *platypus* respectively. Postero-inferior angle of pleon segment 2 with a small tooth; of segment 3 with a smaller tooth and sinus than in the typical northern form (Sars, pl. lix, fig. 1), but larger than those figured by Schellenberg for *intermedia* (*loc. cit.*, p. 132, fig. 9). No ocular pigment remaining in the preserved specimens.

To my mind the southern form should be specifically separated from the northern form.

DISTRIBUTION (Southern form). South Africa (False Bay and Agulhas Bank); West coast of Africa. Also East Africa (Schellenberg).

Ampelisca palmata, Brnrd.

Barnard, 1916, p. 136, pl. xxviii, figs. 30, 31.
Schellenberg, 1925, p. 127.

Occurrence: 1. Walvis Bay. 12. ix. 26. From stomach of *Trigla capensis*. Twenty-four specimens 5–8 mm.
2. St. 90. South Africa. 1 ovig. ♀ 8 mm.

REMARKS. Schellenberg is quite right about the slight variations from the typical form as originally described. The 2nd joint of peraeopod 5 is not always so distinctly truncate below as figured, and the palm is less marked and carries fewer spines. Of the two original specimens one has a very distinct palm as figured, the other approaches more to *spinimana*. I should be quite prepared to sink the species in *spinimana* but that Schellenberg has distinguished both species from the same localities (Senegal and French Congo).

The sealing-wax red ocular pigment is very distinct in the preserved specimens.

DISTRIBUTION. South and west coasts of Africa up to Senegal.

Genus **Byblis**, Boeck.

Stebbing, 1906, pp. 111, 722; 1908 (*Ann. S. Afr. Mus.* VI), p. 71.

Byblis antarctica Schell. (Fig. 40).

Schellenberg, 1931, p. 59, fig. 31.

Occurrence: St. 170. South Shetlands. 5 ♀♀ (4 ovig.) 14–16 mm.

DESCRIPTION. Integument smooth, shining. Head, peraeon and pleon dorsally rounded. Head with very short rostral point; post-antennal angle very obtuse. No corneal lenses; no ocular pigment (as preserved). Side-plate 1 expanded below, broadly rounded (as in *Haploöps tubicola*), setose; 2 shallower than 1, subfalcate, with a semicircular excision on distal half of anterior margin; 3 as deep as 2, its distal anterior margin straight or slightly emarginate; 4 almost as deep as long, slightly but distinctly shallower than 3. Postero-inferior angle of pleon segment 3 broadly rounded. Pleon segment 4 with dorsal depression followed by a rounded hump; segment 6 raised in a smooth angular hump above base of telson. Telson subsemicircular, at base nearly twice as broad as long, cleft for half its length, lobes not dehiscent, slightly emarginate on outer distal margin, where a stout spine and a seta are inserted.

Antenna 1 extending back to about 4th peraeon segment, flagellum 17-jointed, 2nd and 3rd peduncular joints and flagellum with long setae. Antenna 2 about as long as antenna 1, flagellum 12-jointed, 4th and 5th peduncular joints and flagellum with long setae. Mandibular palp slender, 3rd joint two-thirds length of 2nd.

Gnathopod 1, 6th joint shorter than 5th. Gnathopod 2, 6th joint about half length of (dorsal margin) 5th.

Peraeopods 1 and 2, dactyls a little longer than 6th joint, peraeopod 2 strongly setose on hind margin. Peraeopod 3, 2nd joint similar to that of *gaimardi* (Sars, pl. lxiv) with distal groove for reception of 2nd joint of peraeopod 4, anterior margin not setose, 5th joint with transverse rows of spines, hind apex acutely produced nearly half-way along 6th joint, which is abruptly narrower and slightly produced on anterior apex. Peraeopod 4, 2nd joint broadly pyriform, hind margin slightly emarginate distally, anterior margin not strongly convex, with thick fringe of short plumose setae; a series of long plumose setae arise from a longitudinal ridge on inner surface. Peraeopod 5, 2nd joint produced in a long narrow lobe extending to end of 5th joint, upper margin slightly concave, lower margin setose right round to insertion of 3rd joint, setose on inner surface, 4th and 5th joints broad, the latter with a few spines arranged in transverse rows, 6th abruptly narrower, linear, dactyl spiniform.

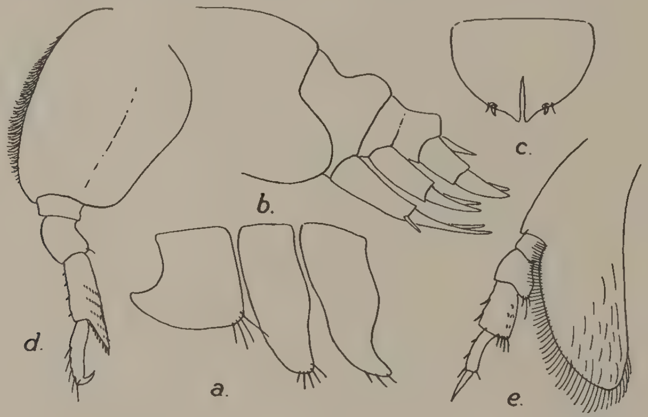

Fig. 40. *Byblis antarctica*, Schell. *a*. Side-plates 2–4. *b*. Pleon segments 3–6. *c*. Telson. *d*. Peraeopod 4. *e*. Peraeopod 5 (inner surface).

Uropod 1 extending slightly beyond uropod 2, rami acuminate, inner slightly shorter than outer, with a few spinules on upper margin, peduncle with strong apical spine. Uropod 3 extending only slightly beyond the others, rami shorter than peduncle, short, lanceolate, with a few spinules on margin.

Branchial lamellae simple.

Remarks. This species is clearly distinguished from the other species by the 2nd side-plate and the telson.

Byblisoides, Brnrd.

Barnard, 1931, p. 426.

Head with post-antennal angle very distinct, pushed forward, so that bases of 2nd antennae are closely juxtaposed to those of 1st antennae. No corneal lenses; ocular pigment not visible. Side-plates 1–4 sloping forwards, 4 obliquely truncate below posterior corner. Telson ovate, longer than broad, cleft nearly to base.

Antenna 1 very short, flagellum 2–3-jointed. Mandibular palp slender, 3rd joint half length of 2nd.

Peraeopods 3 and 4 with 2nd joint broadly expanded, 5th joint with marginal spines only. Peraeopod 5, 2nd joint distally expanded, marginal setae extending round on to margin facing 3rd joint, 6th linear, dactyl spiniform.

Branchial lamellae simple.

REMARKS. The genus is instituted on the very strong post-antennal corner of the head, simple branchiae, the very short 1st antennae, and the short flagellum of antenna 2. The side-plates and peraeopod 5 are like those of *Byblis*, the telson and peraeopods 3 and 4 like those of *Ampelisca*.

Byblisoides juxtacornis, Brnrd. (Fig. 41).

Barnard, 1931, p. 426.

Occurrence: 1. St. 181. Palmer Archipelago. 1 ♂ 16 mm., 3 ♀♀ 22 and 27–28 mm. (one of latter ovig.), 4 juv. 11–16 mm. *Types*.
2. St. 186. Palmer Archipelago. 1 immat. (? ♂) about 16 mm.

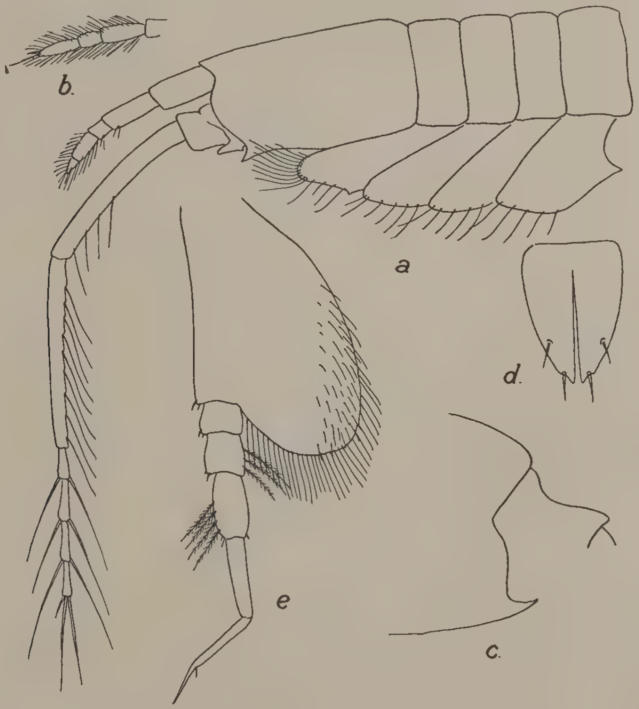

Fig. 41. *Byblisoides juxtacornis*, Brnrd. *a*. Head with antenna 1 (♂) and 2, and peraeon segments 1–4 with side-plates. *b*. Antenna 1 ♀. *c*. Pleon segments 3 and 4. *d*. Telson. *e*. Peraeopod 5 (inner surface).

DESCRIPTION. Head, peraeon and pleon dorsally rounded. Rostrum obsolete. No corneal lenses; no ocular pigment (as preserved). Post-antennal angle acute, far forward, almost at the level of the dorsal apex of head, the bases of 2nd antennae consequently pushed forward into close juxtaposition with bases of 1st antennae. Side-plates 1–4 much deeper than their segments, sloping well forwards, 1–3 narrow oblong, 1 with a denticle on postero-inferior angle, and a fan of plumose setae on antero-inferior corner, lower margins of 1–4 with scattered plumose setae; 4 much deeper than long, oblique, lower margin evenly convex. Pleon segment 3 with posterior margin bisinuate, the postero-inferior angle produced in an acute point. Telson ovate, longer than broad, cleft almost to base, lobes contiguous, each with one apical spine and another submarginal in distal half.

Antenna 1 very short, extending scarcely beyond middle of 4th joint of antenna 2; flagellum 2-jointed in juvenile and ♂, 3-jointed in adult ♀, with plumose setae. Antenna 2 extending back to about 4th peraeon segment, 4th and 5th joints subequal, flagellum 4-jointed, shorter than 5th peduncular joint, each joint widening distally and bearing two long setae. Mandibular palp slender, 3rd joint half length of 2nd.

Peraeopods 1 and 2 similar except for the strong fringe of plumose setae on hind margin in peraeopod 2, 4th joint slender, not strongly expanded. Peraeopods 3 and 4, 2nd joint obliquely ovate in peraeopod 3, subcircular in peraeopod 4, 5th joint with strong marginal spines only. Peraeopod 5, 2nd joint strongly lobed postero-inferiorly, the plumose seta continued round on to margin facing 3rd joint, inner surface also with plumose setae, 5th joint not very stout, 6th slightly narrower, linear, dactyl as long as 6th joint, slender, with one long and one short seta on apex.

Uropod 2, outer ramus with two long spines near apex. Uropod 3, rami lanceolate.

Branchial lamellae simple.

Genus **Haploöps**, Lilj.

Stebbing, 1906, pp. 116, 722.
Chevreux, 1908 (*Bull. Inst. océan. Monaco*, no. 117), p. 6.
Stephensen, 1925, p. 150.

The species described below is a true *Haploöps* except as regards the 5th peraeopod. I think this divergence from the generic diagnosis scarcely calls for a new genus. The internal position of the lower pair of corneal lenses, similar to that in *A. hemicryptops*, is not found apparently in the other species.

Haploöps securiger, Brnrd. (Fig. 42).

Barnard, 1931, p. 426.

Occurrence: 1. St. 27. South Georgia. 4 ♂♂ 26–37 mm., 13 immat. ♀♀ 20–26 mm.
2. St. 42. South Georgia. 2 ♂♂ 30 and 35 mm., 4 immat. ♀♀ 21–27 mm.
3. St. 123. South Georgia. 2 ♂♂ 27 and 36 mm., 3 ♀♀ 33–35 mm., 1 ovig. ♀ 36 mm., 1 juv. 14 mm. *Types.*
4. St. 140. South Georgia. 4 ♀♀ 16–20 mm.
5. St. 144. South Georgia. 1 ovig. ♀ 38 mm., 1 juv. 14·5 mm.
6. St. 146. South Georgia. 11 ♂♂ 27–32 mm., 10 ♀♀ 27–32 mm. (1 ovig. ova 2 mm. in diameter).
7. St. 153. South Georgia. 2 ♂♂ 33 mm., 10 ♀♀ 21–34 mm., 9 juv. 14–20 mm.
8. St. 170. South Shetlands. 1 ♂ 30 mm., 3 ♀♀ 30–31 mm., 2 juv. 16 and 20 mm.
9. St. WS 33. South Georgia. 1 juv. 9·5 mm.

Description. Integument smooth, shiny. Head dorsally keeled, but not sharply. Peraeon dorsally rounded, only on the 7th segment with a very faint indication of the dorsal ridge, which becomes distinct on pleon segments 1–3, especially on 3. In the specimens from no. 1 large ♂♂ are distinctly keeled from peraeon segment 5 to pleon segment 4. Pleon segment 4 with indistinct ridge, but ending in a small point. In young specimens there are 2–3 minute setules on posterior margins of pleon segments 2–4, which get rubbed off in larger specimens. Head with short deflexed rostrum. Corneal lenses 4, the lower pair situate within the lower margin of head, immediately behind bases of 1st antennae, and thus invisible in lateral view. Side-plates 1–3 narrow, 1 produced forwards, 3 shallower than 2. Side-plate 4 much shallower than 1–3, longer than deep, posteriorly produced into a subacute point. Lower margins of 1–4 setose. Side-plates 5–7 successively shallower, 6 and 7 with a few setae on anterior lobes. Postero-inferior angle of pleon segments 1 and 2 rounded, with a few setae, of segment 3 broadly rounded, non-setose. Telson ovate, cleft for three-quarters of its length, lobes contiguous, a single dorsal spinule on each lobe in distal half, and one at apex.

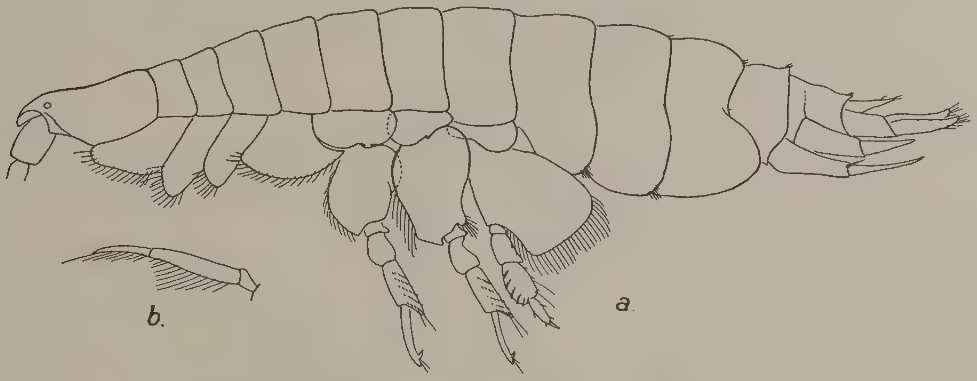

Fig. 42. *Haploöps securiger*, Brnrd. *a*. General view. *b*. Palp of mandible.

Antenna 1, 2nd joint $1\frac{1}{2}$ times 1st, 3rd short, flagellum reaching to about middle of peraeon. Antenna 2, 5th joint shorter than 4th, flagellum reaching to about end of peraeon. Mandibular palp with 2nd joint slender, nearly linear, 3rd two-thirds as long as 2nd.

Gnathopod 1, 6th joint nearly as long as 5th.

Peraeopods 1 and 2, dactyl subequal to 6th joint, peraeopod 2 strongly setose on hind margin. Peraeopod 3, 2nd joint obliquely oval, anterior margin evenly convex, with plumose setae, hind margin proximally lobed, the distal part of margin not in the same plane and thus forming a groove for the reception of 2nd joint of peraeopod 4 (cf. Sars' figure of *Haploöps tubicola*, 1895, pl. lxvii), 5th joint with transverse rows of spinules, posterior apex produced, 6th joint abruptly narrower, the anterior distal apex slightly produced over base of dactyl. Peraeopod 4, 2nd joint with sinuous anterior margin, with plumose setae, hind margin strongly lobed proximally, then concave, apically with a small lobe bearing plumose setae, 5th and 6th joints as in peraeopod 3. Peraeopod 5, 2nd joint with anterior margin straight, hind margin strongly expanded, the lower margin slightly oblique, plumose setae on lower margin and continued round on to margin facing 3rd and 4th joints, 5th joint broad, with transverse rows of spinules on anterior margin, and spines in notches on hind margin, 6th abruptly narrower, linear.

Uropod 1, rami shorter than peduncle, narrow, acuminate, inner shorter than outer. Uropod 2, rami subequal, shorter than peduncle, narrow, acuminate. Uropod 3, rami extending beyond the others, inner ramus slightly shorter than outer, apices upturned, inner margins of both with spines and setae, setae more abundant in ♂ than ♀.

Branchial lamellae pleated on both sides.

Colour of no. 2 recorded for the two large ♂♂ as "Pale yellowish buff, blotched with salmon on lower edges of all somites, on basal segments of last 3 thoracic legs, pleopods and uropods. Eyes dark crimson, with crimson markings on adjacent parts of head". Note 102 for St. 153 gives the colour as "Cream-coloured. Fore part of head splashed with crimson and with purple eyes. Coxal plates of thoracic limbs and posterior end of abdomen tinged with salmon-red".

REMARKS. This fine species is distinguished from the other species by the rounded postero-inferior angle of pleon segment 3, and particularly by the enlarged 2nd joint of peraeopod 5. The specific name refers to the 4th side-plate which here assumes a more even, chopper-like shape than in the other species.

Note 102 refers to the tubes which were collected at St. 153: "Tubes are from 45–50 mm. in length and oval in cross-section with a major diameter of about 10 mm. They are quite straight and are presumably vertical in their position on the bottom. The tubes are easily torn open longitudinally, splitting along the major diameter of the oval. Transversely and in other longitudinal directions they are rather tenacious. Inside they are very smooth, probably lined with some secretion from the Amphipod...". "Other tubes are larger, about 25 mm. in greater diameter and 50 mm. in length. Sometimes, but not always, they taper from bottom to top...." "The tubes are closely aggregated together and apparently cover the entire bottom where the dredging was made. They clogged the bag completely and made examination of the catch extremely difficult."

It may be added that the tubes are open at both ends, but can be accurately closed. They are constructed of mud, with an admixture of sponge spicules, which are probably accidental.

Family HAUSTORIIDAE

Stebbing, 1906, p. 118.
Barnard, 1916, p. 142.
Stephensen, 1925, p. 156.

Genus **Cardenio**, Stebb.

Stebbing, 1906, p. 125.

Originally founded on the ♀ only, the diagnosis of this genus can now be completed thanks to the discovery of the ♂, in which gnathopod 1 is strong and subchelate.

Cardenio paurodactylus, Stebb. (Fig. 43).

Stebbing, 1888, p. 806, pl. liii; 1906, p. 126.
Schellenberg, 1926 *b*, p. 195.

Occurrence: 1. St. MS 65. South Georgia. 1 ♂ 4·5 mm. *Type* of ♂.
2. St. 164. South Orkneys. 1 ♀ 10 mm.

Description ♂. Pleon obscurely denticulate, but with little tufts of setules on posterior margins of posterior segments. Maxilliped with minute rudimentary 4th palpal joint. Antenna 1, flagellum 5-jointed, with sensory setae, accessory flagellum 3-jointed, terminal joint minute. Antenna 2, flagellum 7-jointed, each joint except the last with a spine or spiniform calceolus. Gnathopod 1 stout, 2nd joint somewhat flask-shaped, expanding distally, suture between 4th and 5th joints not distinguishable, 5th very short, 6th very large, oval, palm oblique, not defined except by the row of very regular palisade-like cylindrical spines, which are apically bifid or truncate. Other appendages resembling those of ♀.

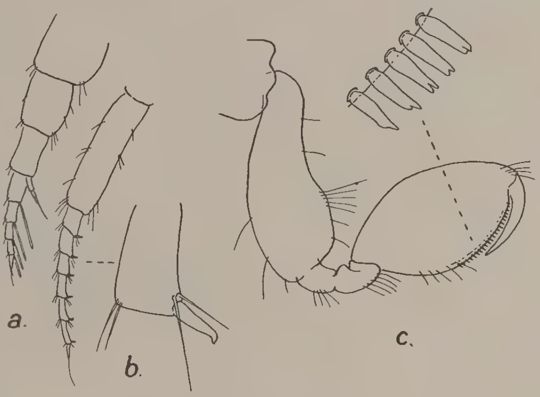

Fig. 43. *Cardenio paurodactylus*, Stebb. ♂. *a*. Antenna 1. *b*. Antenna 2, with one joint further enlarged. *c*. Gnathopod 1, with palmar spines further enlarged.

Remarks. An interesting extension of the habitat of a species originally collected by the 'Challenger', and since then only by the 'Valdivia'. The ♀ is twice as large as the Challenger specimens, but agrees in all respects except that the flagellum of the antenna is 9-jointed.

Distribution. Kerguelen.

Genus Urothoë, Dana.

Stebbing, 1906, pp. 128, 722.
Schellenberg, 1925, p. 135.

Urothoë falcata, Schell. (Fig. 44).

Schellenberg, 1931, p. 61, fig. 32.

Occurrence: 1. St. 51. Falklands. 1 ♂ 5 mm., 1 ovig. ♀ 4·5 mm.
2. St. WS 76. Falklands. 4 ♀♀ 3·5–4·5 mm., picked out of sand.

Description. Eyes invisible. Antero-inferior angle of head produced in an acute point curving forwards. Side-plates 1–3 narrow, 4 as in *elegans* (Sars, pl. xlvii, as *norvegica*). Pleon segment 3 dorsally gibbous as in *Haustorius*; postero-inferior angle of pleon segment 2 quadrate with a minute point, of 3 produced in a large upturned hook-like acute point, the margin above only slightly convex. Telson a little longer than wide, cleft to base, each lobe with an apical spinule, and two lateral setules.

Antenna 1, flagellum 6-jointed, accessory flagellum 2-jointed, the 2nd joint only half as long as the 1st. Antenna 2, 4th and 5th joints subequal, upper margins finely setose, flagellum in ♀ 2-jointed, in ♂ very elongate, about 46-jointed, with a calceolus on each of the basal 4–5 joints and thereafter on every alternate joint. Mouth-parts normal.

Gnathopod 1 and 2 as in *elegans*, but palm not distinct from hind margin of hand.

Peraeopods 1 and 2 as in *elegans*. Peraeopod 3, 2nd joint oblong, anterior margin strongly sinuous, posterior margin nearly straight, feebly crenulate, following joints moderately expanded. Peraeopod 4, 2nd joint rather elongate oblong, anterior margin feebly sinuous, posterior margin straight, with rounded lobe below not extending below end of 3rd joint, a row of plumose setae on inside surface of lobe. Peraeopod 5, 2nd joint oval, posterior margin smooth, with a few setules, lower lobe broadly rounded, not projecting below end of 3rd joint.

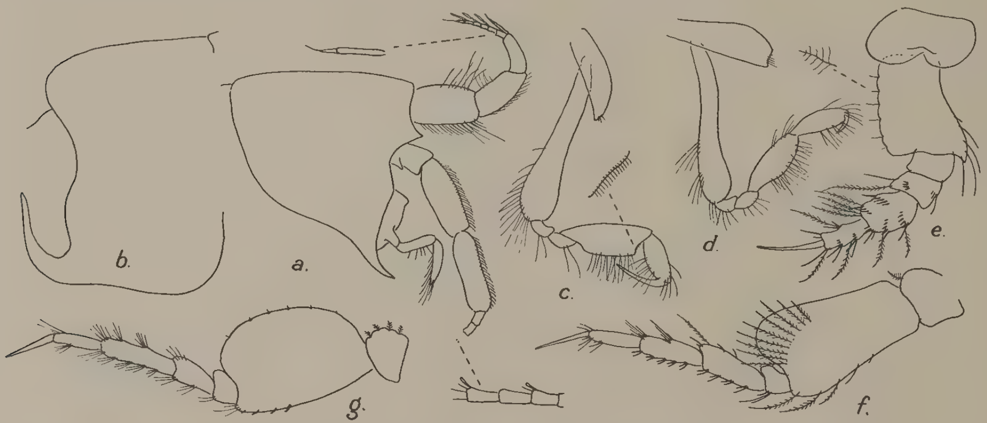

Fig. 44. *Urothoë falcata*, Schell. *a*. Head, with antennae 1 and 2, accessory flagellum and three flagellar joints of antenna 2 further enlarged. *b*. Pleon segment 3. *c*. Gnathopod 1, with distal margin of 5th joint further enlarged. *d*. Gnathopod 2. *e*. Peraeopod 3. *f*. Peraeopod 4 (inner surface). *g*. Peraeopod 5.

Uropods 1–3 as in *elegans*; rami of uropods 1 and 2 each with a subapical spine.

REMARKS. This is the first species of *Urothoë* to be recorded from the sub-Antarctic or Antarctic region, or indeed, barring the South African record (Barnard, 1916, p. 143), from the southern hemisphere.

The gibbous pleon segment 3, the large hook on the postero-inferior angle of pleon segment 3, and the hooked inferior angle of the head are distinctive; *dentata*, Schell., has only a small hook on pleon segment 3.

DISTRIBUTION. South of La Plata River mouth.

Genus **Urothoides**, Stebb.

Stebbing, 1906, p. 132.

From the description of the species given below it will be seen that the differences between this genus and *Urothoë* as set out in Stebbing's key (1906) do not apply. The shape of the head, and of the 1st and 4th side-plates should be used instead of the 4th and 5th peraeopods.

Urothoides oniscoides, n.sp. (Fig. 45).

Occurrence: St. 196. South Shetlands. 1 ♀ with embryos 5 mm.

Description. Head and body depressed, very broad. Integument thickly covered with minute bristles. Head in dorsal view broader than long, antero-lateral angle rounded quadrate, anterior margin broadly convex; in lateral view very shallow, post-antennal angle obsolete, rostral projection not deflexed. No eyes. Side-plate 1 much expanded below, curving forwards alongside head, 2 and 3 oblong, somewhat curved, lower margins straight, 4 with anterior margin strongly convex, whole hind margin concave. Pleon segment 2 with postero-inferior angle rounded-quadrate, lower margin setose; pleon segment 3 with postero-inferior angle produced in a strong acute point. Segments 4 and 5 short, indistinctly separated. Telson as in *lachneëssa* Stebb.

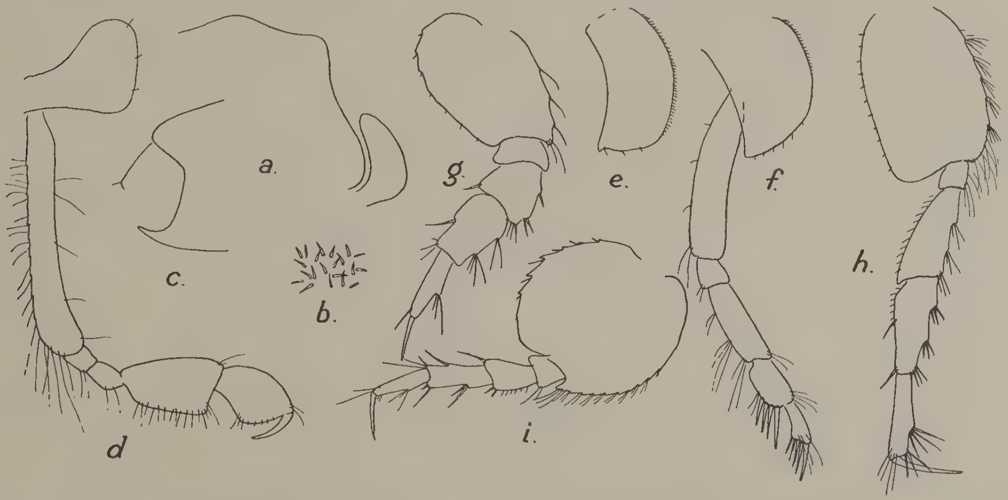

Fig. 45. *Urothoides oniscoides*, n.sp. *a*. Dorsal view of head, with side-plate 1 in perspective. *b*. Portion of integument highly magnified. *c*. Pleon segment 3. *d*. Gnathopod 1. *e*. Side-plate 3. *f*. Side-plate 4 and peraeopod 2. *g*. Peraeopod 3. *h*. Peraeopod 4. *i*. Peraeopod 5.

Antenna 1, flagellum 5-jointed, accessory flagellum 3-jointed. Antenna 2, flagellum 5-jointed. Mouth-parts as in *lachneëssa*; mandibular palp rather longer.

Gnathopods 1 and 2, and peraeopods 1 and 2 as in *lachneëssa*, but peraeopods 1 and 2 rather more slender. Peraeopod 3 as in *lachneëssa*, but 4th and 5th joints not quite so stout. Peraeopod 4, 2nd joint oval, hind margin not concave, rest of limb much longer proportionately, and 4th and 5th joints not more expanded than in *Urothoë*. Peraeopod 5, 2nd joint subcircular, not produced downwards beyond 3rd joint, hind margin serrate with sharp points, rest of limb much longer proportionately than in *lachneëssa*. Uropods 1–3 as in *lachneëssa*.

Remarks. The resemblance of this species to the Challenger species *lachneëssa* from Kerguelen are no less remarkable than the differences between them.

Here the rostrum is not deflexed, the 2nd side-plate not narrow, the 4th and 5th joints of peraeopod 4 not broadly expanded, the 2nd joint of peraeopod 5 not produced downwards, and the postero-inferior angle of pleon segment 3 has a strong acute point. The original description of *lachneëssa* (1888, p. 825, pl. lvii) says in regard to the last-mentioned feature "a slightly outdrawn rounded point, with a deep re-entering angle above it". In the 1906 diagnosis this becomes simply "rounded". This one feature would seem enough to separate the two species.

Stebbing (1888, p. 829) also says that in a second specimen the joints of the peraeopods were not so broadly expanded as in the ♀ figured. Even so, one can scarcely reconcile the 4th and 5th peraeopods of the present form with those of *lachneëssa*.

Side-plates 2 and 3 are quite different in shape in the two species, though one might assume that Stebbing's figure of side-plate 2 was drawn from an imperfectly flattened preparation if he had not expressly described it as narrow. (It may be noted that the expansion of side-plate 1 seems to have been reversed relatively to the limb in the Challenger figure.)

This animal looks very like an Oniscid wood-louse.

Phoxocephalopsis, Schell.

Schellenberg, 1931, p. 69.
Barnard, 1931, p. 426 (*Haustoriella*).

Head with short rostrum and obsolete post-antennal angles. Eyes small, feeble. Side-plates 1–4 successively deeper, 4 broadly ovate, scarcely emarginate behind. Pleon segments 2–4 with pleura produced backwards, especially segment 2. Telson broader than long, cleft to base.

Upper lip projecting beyond epistome. First antenna with first two joints expanded. Second antenna with 4th joint strongly expanded, 5th less so. Mandible with three spines on spine row, and palp strong. Lower lip with broad inner lobes, outer lobes with short but distinct mandibular processes. Maxilla 1, inner lobe ovate, with a single strong seta on middle of inner margin, palp 2-jointed, 1st joint longer than 2nd, which bears three strong plumose setae on apex. Maxilla 2, lobes broadly oval, inner with oblique row of plumose setae as well as the marginal row. Maxilliped, inner plate truncate, outer ovate, 2nd joint of palp strongly expanded internally, 3rd angularly expanded externally, 4th slender.

Gnathopod 1 as in *Urothoë*, but 6th joint weaker and dactyl short and curved. Gnathopod 2 more slender than gnathopod 1, 5th joint fusiform.

Peraeopods 1 and 2, 2nd and 4th joints stout, 5th very short, dactyls slender. Peraeopod 3, 3rd–5th joints very broad, with transverse rows of spines as in *Haustorius*. Peraeopods 4 and 5, 4th and 5th joints moderately expanded.

Uropod 1, rami acuminate. Uropod 2, rami subacute, spinose. Uropod 3, peduncle broad, spinose, rami foliaceous with spines and long plumose setae.

REMARKS. This form exhibits some of the characters of *Haustorius* combined with others of *Urothoë*. The antennae, 3rd joint of palp of maxilliped, mandibular palp, gnathopod 1, peraeopod 3, and side-plate 4 are nearest to those of *Haustorius*; the other mouth-parts, uropods, and the presence of a 4th palpal joint on the maxilliped, and of dactyls on all the peraeopods remind one of *Urothoë*. On the whole the animal resembles *Haustorius* more than *Urothoë*, though it has very peculiar features of its own, the most noteworthy being the prolongation of the epimeron of pleon segment 2. It is certainly less specialized than *Haustorius*.

Phoxocephalopsis zimmeri, Schell. (Figs. 46, 47).

Schellenberg, 1931, p. 70, fig. 36.
Barnard, 1931, p. 426 (*H. psammophila*).

Occurrence: St. WS 96. South America. Two mutilated specimens from stomach of "*Psammobates* xlix," estimated length 12 mm.

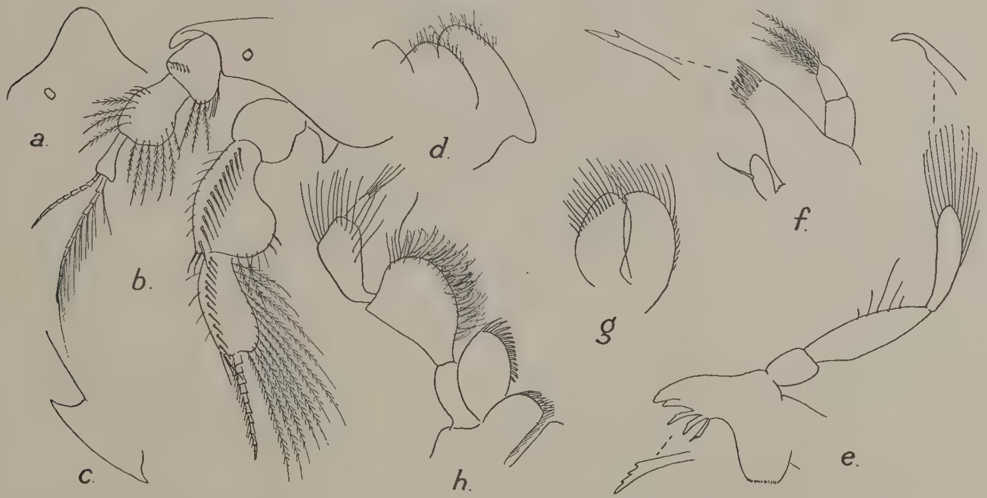

Fig. 46. *Phoxocephalopsis zimmeri*, Schell. *a*. Dorsal view of head. *b*. Head with antennae 1 and 2. *c*. Profile of epistome and upper lip. *d*. Lower lip. *e*. Mandible. *f*. Maxilla 1. *g*. Maxilla 2. *h*. Maxilliped.

DESCRIPTION. Head with a distinct though short deflexed rostrum, in dorsal view somewhat pointed, but apically rounded. Antero-lateral angle quadrate, post-antennal angle obsolete. Eyes small and feeble, oval, dark. Side-plates 1–4 successively deeper, 1 narrowing below, 2 widening below, lower margins of 1–3 straight, 4 ovate, somewhat flattened on lower margin, posteriorly scarcely emarginate. Pleon segments 2–4 with the epimera produced backwards, on segment 2 strongly produced in a rounded lobe, with a minute hook-like tooth below, 3 rather less strongly produced in an acute lobe, also with a hook-like tooth on lower margin, 4 shortly produced in an acute lobe. Pleon segment 3 not dorsally gibbous. Telson broader than long, cleft to base, lobes apically subacute with a group of three spines near base on outer margin, and 3–4 along the margin.

Antenna 1, 1st and 2nd joints enlarged, 2nd with numerous plumose setae, 3rd much narrower, flagellum 12-jointed, with numerous long sensory setae on lower margin, accessory flagellum 9-jointed. Antenna 2, 3rd joint subcircular, 4th strongly expanded, lobed on lower margin, 5th oblong, narrower than 4th, both 4th and 5th with long plumose setae on lower margin, and a row of spines near upper margin on outer surface, flagellum small, 10-jointed, setose on upper margin.

Epistome flat, upper lip projecting beyond it, in side view slightly upturned at its upper angle. Mandible, cutting edge narrow, subacute, secondary cutting plate similar, spine row of three stout spines, molar well developed, palp strong, 2nd joint fusiform, 3rd shorter than 2nd, somewhat clavate, with long simple setae which are apically slightly hooked. Lower lip, inner lobes broad, outer with short mandibular processes. Maxilla 1, outer lobe with numerous spines, inner ovate, with one strong seta in middle of inner margin, palp 2-jointed, 1st joint strong, 2nd shorter, with three strong plumose setae apically. Maxilla 2, both lobes ovate, apically rounded, inner with an oblique row of plumose setae as well as the marginal row. Maxilliped, inner plate truncate, outer ovate, with close-set curved spines on inner margin, 2nd joint of palp strongly expanded on inner margin, 3rd angularly expanded on outer margin, 4th terminal, slender.

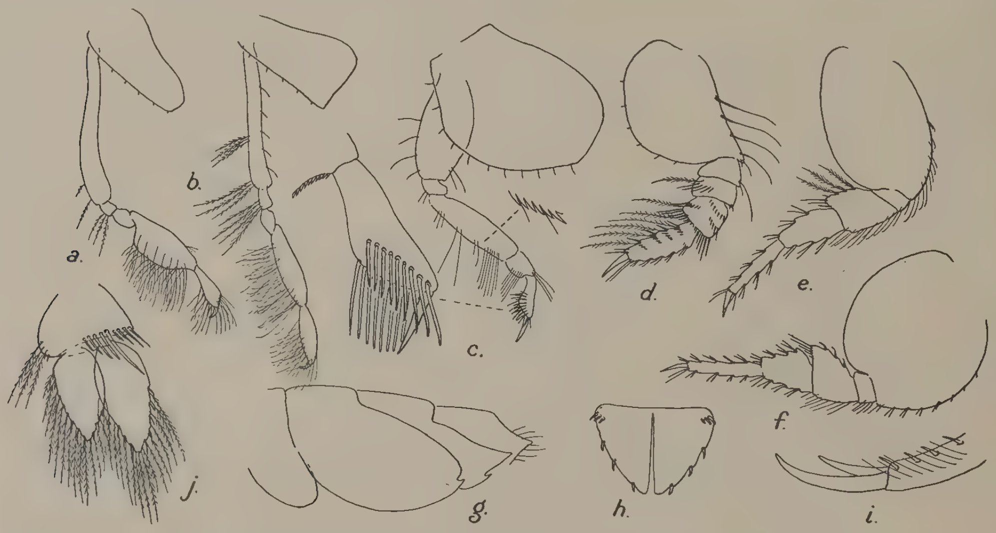

Fig. 47. *Phoxocephalopsis zimmeri*, Schell. *a*. Gnathopod 1. *b*. Gnathopod 2. *c*. Peraeopod 2, with margins of 4th–6th joints further enlarged. *d*. Peraeopod 3. *e*. Peraeopod 4. *f*. Peraeopod 5. *g*. Pleon segments 1–4. *h*. Telson. *i*. Uropod 1. *j*. Uropod 3 (upper surface).

Gnathopod 1 slender, 4th joint expanded on lower margin, with thick fringe of long simple setae, 6th fusiform, narrowing rather rapidly distally, with thick brush of simple setae surrounding the short curved dactyl. Gnathopod 2 slightly more slender than gnathopod 1, 5th joint narrow, fusiform, 6th also narrow, 5th and 6th with long simple setae, dactyl short, curved.

Peraeopods 1 and 2, 2nd joint stout, fusiform, 4th joint elongate, minutely serrulate on lower margin and with groups of setae, 5th very short, also serrulate on lower margin, 6th clavate, with two rows of strong spines, one submarginal on the outer surface, the other on inner margin, dactyls slender, straight, only a little larger than the largest spines. Peraeopod 3, 2nd joint ovate, somewhat angular on hind margin, 3rd–5th joints very broad, 6th abruptly narrower, the 4th and especially the 5th and 6th joints with transverse rows of stout spines, and a few plumose setae on hind margins, dactyl straight. Peraeopod 4, 2nd joint oval, 3rd not very broad, 4th moderately expanded, with spines and a few plumose setae on hind margin, 5th narrower, 6th still narrower, margins with stout spines. Peraeopod 5, 2nd joint subcircular, 4th and 5th joints expanded, 5th distinctly narrowing distally.

Uropod 1, peduncle with a few spines on upper margin, and numerous long setae on inner and outer surfaces, rami acuminate, inner considerably shorter than outer. Uropod 2, peduncle with rows of spines on inner and outer upper margins, rami subequal, apically subacute, inner margins and apices with strong spines. Uropod 3, peduncle broad, with a transverse row of stout spines on upper distal margin, starting from outer margin, and a similar row on the lower distal margin, starting from inner margin, rami foliaceous, broadly ovate, outer longer than inner, with a small 2nd joint, margins with spines and long plumose setae.

Branchial lamellae large, simple. Brood lamellae large, moderately broad.

REMARKS. Although these two specimens are more or less dismembered, they show all characters clearly. The species is evidently a burrower and undoubtedly the best way to collect further specimens would be to examine the stomachs of all bottom-dwelling fishes.

The 6th joint of peraeopods 1 and 2 with its double row of strong spines forms a very pretty scooping apparatus; at least one cannot help interpreting it as such. Both specimens have foliaceous 3rd uropods; one is a ♀ with brood lamellae, the other may perhaps be a ♂.

DISTRIBUTION. South of La Plata River mouth; Punta Arenas; Falkland Islands.

Family PHOXOCEPHALIDAE

Stebbing, 1906, p. 133.
Barnard, 1930, p. 330.

Genus **Phoxocephalus**, Stebb.

Stebbing, 1906, p. 134.
Stephensen, 1925, p. 159.
Barnard, 1930, p. 330.

Phoxocephalus coxalis, n.sp. (Fig. 48).

Occurrence: St. WS 53. South Georgia. 2 ♂♂ 4·5 mm.

DESCRIPTION ♂. Rostrum rather bluntly rounded (cf. *P. rotundifrons*, *infra*). Eyes large, broadly oval, dark. Side-plate 1 narrow-oblong, tapering below, 2 similar but a little wider, 3 oblong, a little wider than 2, all three with a tuft of setae at postero-inferior angle; side-plate 4 greatly expanded, subtriangular and subequilateral, the anterior margin, however, steeper than the posterior margin which is not excavate; 5 and 6 with posterior lobes rounded, anterior lobes nearly obsolete. Pleon segment 3, postero-inferior angle produced and broadly rounded, setae on lower margin only.

Antenna 1 similar to that of *holbölli* (Sars, 1895, pl. xlix), but with a group of setae on lower distal corner of 2nd joint, flagellum 6-jointed, accessory flagellum 3-jointed. Antenna 2 as in *holbölli*, but with more numerous setae along the distal margin of 4th joint, 5th with one calceolus on lower apex, flagellum multiarticulate, proximal 3–4 joints each with a calceolus, after that every alternate joint apically bulbous and carrying a calceolus.

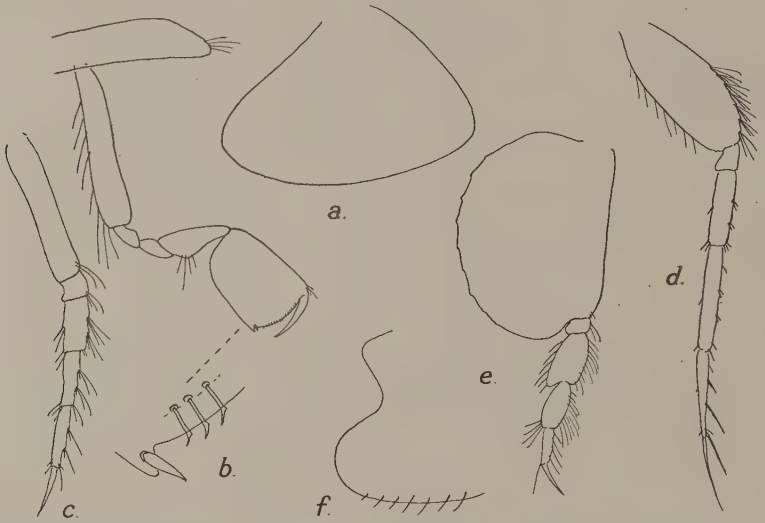

Fig. 48. *Phoxocephalus coxalis*, n.sp. *a*. Side-plate 4 (anterior edge on right). *b*. Gnathopod 1, with palmar margin further enlarged. *c*. Peraeopod 3. *d*. Peraeopod 4. *e*. Peraeopod 5. *f*. Pleon segment 3.

Gnathopods 1 and 2 as in *tenuipes* Steph. 1925, the very narrow junction between 5th and 6th joints reminiscent of *Eusirus*, 6th joint broadly subquadrangular, longer than wide, palm transverse, convex, setulose, defined by a strong tooth with a spine.

Peraeopods 1 and 2 as in *tenuipes*, dactyls nearly four-fifths as long as 6th joint. Peraeopod 3 elongate, 2nd joint slender, cylindrical, dactyl three-quarters length of 6th joint. Peraeopod 4 more elongate than peraeopod 3, 2nd joint fusiform, more strongly convex at the distal anterior margin which bears several groups of long setae, dactyl very slender, spiniform, nearly as long as 6th joint. Peraeopod 5, 2nd joint broadly expanded, no plumose setae on any of the joints.

In other respects—telson, uropods, mouth-parts—as in *holbölli*.

Remarks. As regards the gnathopods and peraeopods this species is the counterpart of the northern *tenuipes*, Steph., though there are several differences in these appendages, notably the 2nd joints of peraeopods 3 and 4. The enormous development of the 4th side-plate is an outstanding feature. A tendency in this direction is seen in the genus *Harpinia*, with which genus the present form has in common the narrow 2nd joint of peraeopod 3. In other respects, however, it is a *Phoxocephalus*.

Genus **Harpinia**, Boeck.

Stebbing, 1906, pp. 140, 723.
Stephensen, 1925, p. 163.

Harpinia cariniceps, n.sp. (Fig. 49).

Occurrence: 1. St. 162. South Orkneys. 1 juv. 9 mm.
2. St. 167. South Orkneys. 30 ♀♀ 12–17 mm., 6 ovig. ♀♀ 17–18 mm. *Types*.
3. St. 181. Palmer Archipelago. 5 ♀♀ (3 ovig.) 17–18 mm.
4. St. 186. Palmer Archipelago. 1 ♀ 18 mm.
5. St. 195. South Shetlands. 4 juv. 8–10 mm.

Description ♀. Body glabrous. Head acute in front, sharply keeled dorsally. Side-plate 4 as in *plumosa* (Sars, 1895, pl. lii), 5th with posterior lobe a little deeper than in that species. Postero-inferior angle of pleon segment 3 produced in a strong, slightly upturned process as in *plumosa* or *obtusifrons* (Stebbing, 1888, pl. lvi), no oblique row of setae on surface. Segment 4 with gently convex dorsal profile beyond the basal depression. Telson, lobes parallel-sided, apically broadly rounded.

Antenna 1, flagellum 10–11-jointed, accessory flagellum 7–8-jointed. Antenna 2, basal joint with a large curved ensiform process, apically subacute, as in *obtusifrons*, 4th joint triangularly expanded, outer surface with an oblique row of spine setae, the upper ones simple, the lower plumose, upper apex with several long simple setae, lower margin with long plumose setae, and a submarginal row of simple spine setae, flagellum 12-jointed.

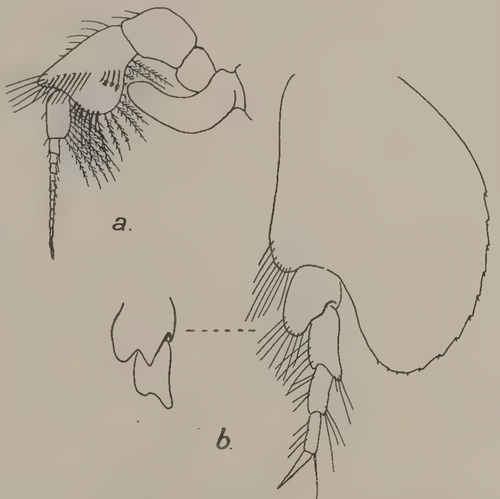

Fig. 49. *Harpinia cariniceps*, n.sp. *a*. Antenna 2. *b*. Peraeopod 5, with inner surface of 2nd and 3rd joints drawn separately.

Peraeopod 4 like that of *obtusifrons*, but 2nd joint twice as long as broad, upper hind angle rather prominent, hind margin concave. Peraeopod 5, 2nd joint like that of *obtusifrons*, 3rd distally lobed anteriorly, 4th distally lobed posteriorly.

Remarks. A species allied to *plumosa*, but more especially it may seem to *obtusifrons*. The ensiform projection on antenna 2 appears to arise from the 2nd joint and to represent the antennal cone, though both Stebbing and Sars consider that it arises from the 1st joint. If it were the 2nd joint, then the large triangular joint becomes the 5th joint of the peduncle, and the following abruptly smaller joint the 1st joint of the flagellum, which seems more reasonable. I have illustrated what appears to be the very short true 1st joint.

Genus **Heterophoxus**, Shoem.

Shoemaker, 1925, p. 22.
Barnard, 1930, p. 333.
Schellenberg, 1931, p. 73.

The great development of the basal process on antenna 2 seems to be peculiar to this genus and *Harpinia*.

Heterophoxus videns, Brnrd.

Chilton, 1912, p. 477 (*obtusifrons*, *non* Stebb.).
Barnard, 1930, p. 334, fig. 11.
Schellenberg, 1931, p. 74, figs. 37*b*, 38.

Occurrence: 1. St. 27. South Georgia. 1 ♀ 6 mm.
2. St. 156. South Georgia. 1 ♂ 6 mm.
3. St. 195. South Shetlands. 8 ♀♀ 4·5–6 mm.
4. St. WS 25. South Georgia. 2 ♀♀ 5–6 mm.

REMARKS. The basal ensiform process of antenna 2 was not mentioned in the original description. This feature, the postero-inferior angle of pleon segment 3, and the villose hind segments of the body constitute easy identity marks for this species.

The absence of the antennal process in Stephensen's specimens from the Auckland Islands (1927, p. 306, fig. 6) indicates a separate species; it is certainly not *obtusifrons*, Stebb., apart from other considerations.

DISTRIBUTION. Ross Sea area, 82–457 m.; South Orkney Islands.

Heterophoxus trichosus, n.sp. (Fig. 50).

Occurrence: St. 175. South Shetlands. 1 ♀ 12 mm.

DESCRIPTION ♀. Body dorsally rounded, setose on the posterior peraeon segments and on pleon segments 1–3. Head with hood apically rounded (cf. *Harpinia plumosa*, Sars, pl. lii). Eyes small, narrow oval, black. Side-plate 4 with shallow but better marked excavation than in *pennatus* Shoem. Pleon segment 3 with postero-inferior angle produced in an upturned acute process. Telson as in *videns*, Brnrd., with 2–3 setae on apex of each lobe.

Antenna 2 of the *Harpinia* type; basal joint with curved ensiform process as in *pennatus*, *videns* and *Harpinia cariniceps*.

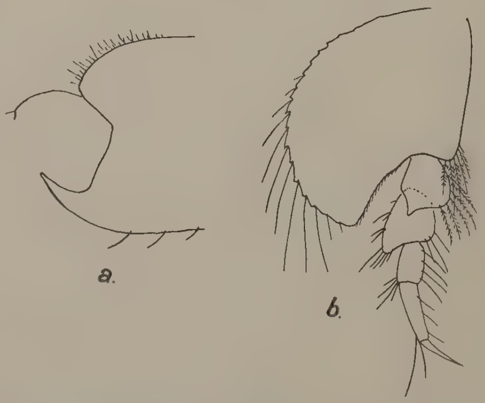

Fig. 50. *Heterophoxus trichosus*, n.sp. *a*. Pleon segments 3 and 4. *b*. Peraeopod 5.

Gnathopod 1, 5th joint rather larger proportionately than in *pennatus*. Peraeopod 5, 2nd joint considerably more broadly expanded than in either *pennatus* or *videns*, hind margin with sharp serrations, anterior margin of lobe facing the 3rd and 4th joints slightly concave, the lower anterior angle rounded-quadrate, 4th joint lobed on hind apex as in *videns*.

REMARKS. This species resembles the genotype *pennatus*, Shoem., very closely, but is distinguished by the 5th peraeopod and 4th side-plate. From the other Antarctic species the acutely produced postero-inferior angle of pleon segment 3 easily distinguishes the new form.

Genus **Parharpinia**, Stebb.

Stebbing, 1906, p. 147.
Tattersall, 1922, p. 4.

Tattersall has doubted the value of the characters used to separate *Parharpinia* from *Pontharpinia*. The expansion of the 4th and 5th joints of peraeopods 3 and 4 certainly seems to show gradations. The following species are typical *Parharpinia* according to Stebbing's diagnosis.

Parharpinia obliqua, n.sp. (Fig. 51).

Occurrence: 1. St. 136. South Georgia. 1 ♂ 11 mm.
2. St. 175. South Shetlands. 1 ♀ 15 mm.

DESCRIPTION. Body dorsally rounded, glabrous. Hood flattened, apex in dorsal view rounded (cf. Sars, pl. li, *Paraphoxus oculatus*). Eyes black, in ♂ large, obliquely ovate, nearly meeting dorsally, in ♀ small, oval. Side-plates 1–4 fringed with setae on lower margin; 1 scarcely widened below, 4 as deep as long, excavation shallow. Postero-inferior angle of pleon segment 3 rounded, with an oblique row of long spine-setae; segment 4 with evenly rounded dorsal profile. Telson with the lobes apically rounded, a spine and a setule in a little notch towards the outer margin.

Antenna 1, 2nd joint with long setae on lower margin in ♀, flagellum 12-jointed in ♂, 11-jointed in ♀; accessory flagellum 8-jointed in ♂, 7 in ♀. Antenna 2, 4th joint expanded below, but width not more than two-thirds length, lower margin with very long spine-setae, upper margin in ♀ with some long setae on inner side, on outer side a series of about 14 very strong outstanding spines, in ♂ with thick fringe of setae, 5th joint in ♀ also with very long setae on lower margin and strong outstanding spines on upper outer margin, the latter consisting of 4 in the middle of the joint, 2 towards the apex, in ♂ upper margin with 8–9 fascicles of setae and 8–9 calceoli, flagellum 12-jointed in ♀, multiarticulate and calceoliferous in ♂. Third palpal joint of mandible equal to 1st and 2nd together. Maxilliped, outer plate easily extending beyond middle of 2nd joint of palp, fringed on inner margin with about 12 graduated serrate spines, with 2–3 plumose spine-setae distally.

Gnathopods 1 and 2, similar to Tattersall's figure of *villosa* (1922, pl. i, figs. 9, 10) but 5th joint in gnathopod 1 measured along its upper margin nearly as long as 6th joint.

Peraeopods 1 and 2, 4th joint stout as in *villosa*. Peraeopod 3, 2nd joint pyriform, anterior margin straight, with a few long setae, posterior margin gently convex, with minute setules, 4th and 5th joints nearly as *villosa*. Peraeopod 4, 2nd joint stout, anterior margin angularly rounded, strongly setose, especially distally where the setae are plumose and form a thick fringe, hind margin slightly concave in ♀, straight in ♂, with a small rounded lobe distally. Peraeopod 5, 2nd joint almost subcircularly expanded, extending to end of 4th joint, margin shallowly notched, 3rd joint somewhat lobed on anterior apex, 4th with anterior margin convex, hind apex produced in a short acute lobe.

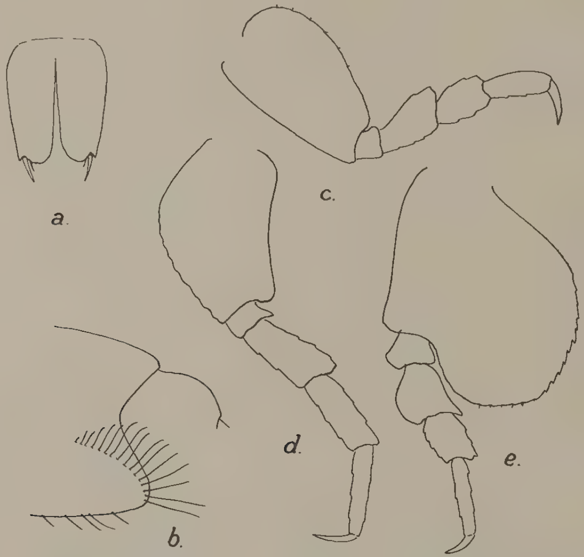

Fig. 51. *Parharpinia obliqua*, n.sp. *a*. Telson. *b*. Pleon segments 3 and 4. *c*. Peraeopod 3. *d*. Peraeopod 4 ♀. *e*. Peraeopod 5. (Setae in *c*, *d*, *e* omitted.)

Uropod 2, peduncle fringed with upstanding spines on upper margin. Uropod 3, peduncle with a half circlet of spines around the lower apex, inner ramus two-thirds length of outer in ♀, in ♂ rami subequal, much enlarged, with long plumose setae.

Remarks. Stebbing has recorded the Australian *Pontharpinia rostrata* (Dana) from the Falkland Islands (1914, p. 357), but the present species will not fit in with his 1906 diagnosis as regards the maxilliped, gnathopods and 3rd–5th peraeopods. The characters of peraeopods 3–5 also differentiate it from the West Australian specimen which Tattersall referred to *villosa*.

It bears a close resemblance to *Paraphoxus pyripes*, Brnrd. (1930, p. 332, fig. 10), as regards peraeopods 3–5, though the postero-inferior angle of pleon segment 3 is quadrate in the latter; the present form, however, has a 2-jointed palp on maxilla 1.

The ♂ was caught near the surface in a night haul.

The specific name refers to the oblique row of setae on the epimeron of pleon segment 3.

Parharpinia sinuata, n.sp. (Fig. 52).

Occurrence: 1. St. 159. South Georgia. 1 ♀ 14 mm. *Type*.
2. St. WS 88. Cape Horn. 1 ♀ 11 mm., 1 juv. 8 mm.

DESCRIPTION ♀. Distinguished from *obliqua* by the following characters.

Hood more sharply pointed. Eyes considerably larger. Pleon segment 3 with postero-inferior angle rounded, with a slight emargination above, set with a graduated series of setae; no oblique row of setae on the lateral surface.

Gnathopods 1 and 2, 5th joint longer proportionately to 6th; in gnathopod 1 it is equal to 6th, in gnathopod 2 almost equal to 6th (measured along upper margin).

Peraeopod 3, 2nd joint not markedly pyriform, the hind margin evenly convex. Peraeopod 4, 2nd joint not angularly but evenly convex on anterior margin, more strongly spinose, but with a feeble fringe of plumose setae at apex, or none at all, hind margin straight, not concave, with a larger rounded lobe at hind apex. Peraeopod 5, 3rd and 4th joints with anterior margin straight, not lobed or markedly convex, 4th not produced on hind apex.

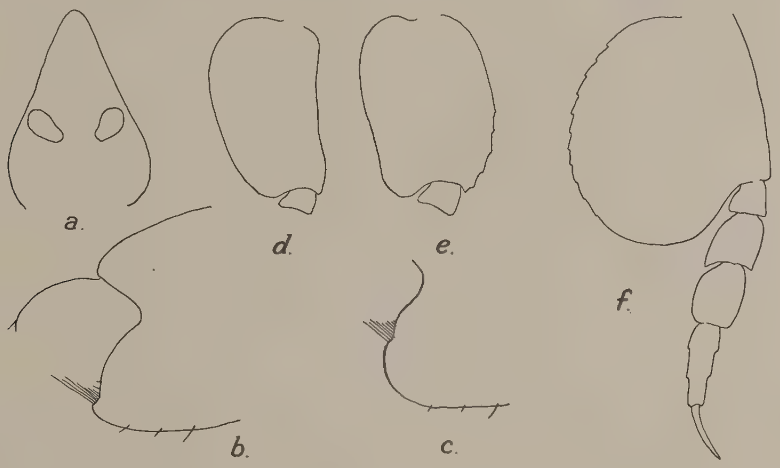

Fig. 52. *Parharpinia sinuata*, n.sp. *a*. Dorsal view of head. *b*. Pleon segments 3 and 4 (of type). *c*. Postero-inferior corner of pleon segment 3 (St. WS 88). *d*. 2nd joint of peraeopod 3. *e*. 2nd joint of peraeopod 4. *f*. Peraeopod 5. (Setae in *d*, *e*, *f* omitted.)

REMARKS. Like the previous species this differs from *villosa*; in fact considerably more so, because of the greater length of the 5th joint in both gnathopods. In this latter respect it somewhat resembles *Protophoxus australis*, Brnrd., but there the 5th joint is much more slender.

The specific name refers to the slight sinuosity of the hind margin of pleon segment 3. The position of this slight sinus with its group of setae varies; in the type it is low down and the angle of the segment is consequently narrowly rounded; in the other two specimens it is higher up and the angle is broadly rounded. The other characters are identical, so that one must regard this feature as variable.

The description of the postero-inferior angle of pleon segment 3 given by Stebbing (1906, p. 146) for *Pontharpinia rostrata* might perhaps apply here. But I am unwilling to identify the Discovery specimens with the Australian *rostrata*, in spite of Stebbing's record of it from the Falkland Islands, until the Australian forms *pinguis*, *rostrata* and *villosa* have been given an exact status.

Parharpinia rotundifrons, n.sp. (Fig. 53).

Occurrence: 1. St. 39. South Georgia. 1 ♀ 9 mm. *Type*.
2. St. 141. South Georgia. 1 ♀ 8 mm.
3. St. WS 25. South Georgia. 1 juv. 4·5 mm.

DESCRIPTION ♀. Differing from the preceding species as follows.

Hood broadly rounded in front. Pleon segment 3 with postero-inferior angle produced in a rather narrowly rounded lobe, slightly concave on its upper margin which bears 3–4 minute spinules.

Gnathopods 1 and 2, proportions of 5th joint to 6th intermediate between *obliqua* and *villosa* (as figured by Tattersall), i.e. in gnathopod 1, 5th joint is three-quarters length of 6th, in gnathopod 2 half its length.

Peraeopods 3–5 as in *sinuata*, but anterior margin of peraeopod 4 more strongly convex.

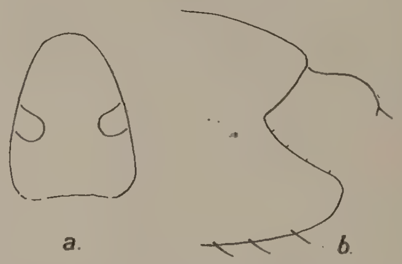

Fig. 53. *Parharpinia rotundifrons*, n.sp. *a*. Dorsal view of head. *b*. Pleon segments 3 and 4.

Family AMPHILOCHIDAE

Barnard, 1916, p. 143; 1930, p. 337.
Schellenberg, 1926, p. 301; 1931, p. 92.

Genus **Gitanopsis**, G. O. Sars.

Stebbing, 1906, p. 153.
Barnard, 1916, p. 144.
Schellenberg, 1926, p. 301; 1931, p. 95.

Gitanopsis antarctica, Chevr.

Chilton, 1912, p. 479. (*Amphilochus squamosus*, *non* Thoms.)
Chevreux, 1913, p. 104, figs. 13–15.
Schellenberg, 1926, p. 301. (*Amphilochus squamosus*, *non* Thoms.)

Occurrence: St. MS 67. South Georgia. 1 ovig. ♀ 4 mm.

REMARKS. Although Chilton has united *antarctica* with the New Zealand *Amphilochus squamosus*, and Schellenberg has accepted this, I think it better to suspend judgment for the present. No detailed modern figures of the New Zealand form have been given, and the uniting of the two forms rests on the individual opinion of one author: "I cannot find any character of importance...". (Chilton, 1923, *Trans. N.Z. Inst.* LIV, p. 240.) Another reason for not following Chilton is that he also included *marionis*, Stebb., in the synonymy, to which Schellenberg, quite rightly in my opinion, does not subscribe.

Colour (as preserved) pale horn-coloured, with numerous maroon specks over head, peraeon, pleon, side-plates and 2nd joints of peraeopods 3–5, eyes dark brown.

DISTRIBUTION. Petermann Island, 3 m.; South Orkneys; Kerguelen.

Hoplopleon, n.g.

Close to *Peltocoxa* but with mandibular palp absent, pleon segment 4 very long, telson short, and accessory flagellum of antenna 1 absent.

The finding of a second species closely allied to *Peltocoxa australis*, Brnrd., and exhibiting the same features which distinguish the latter from the true European *Peltocoxa*, renders a new genus necessary. The genotype is *Peltocoxa australis*, Brnrd. 1916.

Hoplopleon medusarum, n.sp. (Fig. 54).

Occurrence: Hoetjes Bay (Saldanha Bay), South Africa. 5. x. 26. 0 m. from Medusae.

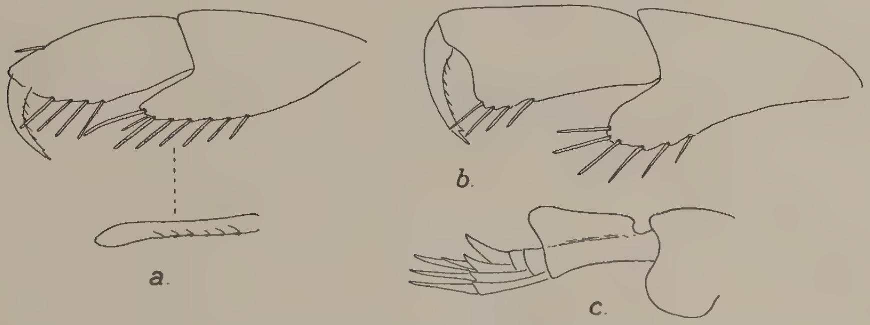

Fig. 54. *Hoplopleon medusarum*, n.sp. *a*. Gnathopod 1, with spine further enlarged. *b*. Gnathopod 2. *c*. Pleon segments 3–6.

DESCRIPTION. Very closely resembling *australis*, except in gnathopods 1 and 2 and peraeopods 4 and 5.

Gnathopod 1, 5th joint with 6–7 strong spine-setae on lower margin and apex, 6th joint ovate, palm ill-defined, with 4 strong spine-setae, finger with spinules along inner margin and a denticle near apex. Gnathopod 2, 5th joint with 6 strong spine-setae on lower apex, 6th widening slightly to the transverse concave palm, defining angle rounded, with 4 strong spine-setae.

Peraeopods 4 and 5, 2nd joint with hind margin convex, not straight or nearly so as in *australis*, the contrast most noticeable in peraeopod 4.

REMARKS. Whereas the specimens of *australis* were found amongst littoral Hydroids, Algae, etc., the present specimens were extracted from a jellyfish.

Family LEUCOTHOIDAE

Stebbing, 1906, p. 161.

Schellenberg, 1928 (*Tr. Zool. Soc. Lond.*, 1928, pt. 5), p. 635 (new genus).

Genus Leucothoë Leach.

Stebbing, 1906, pp. 163, 724.

Leucothoë spinicarpa (Abildg.).

Pfeffer, 1888, p. 128, pl. ii, fig. 4 (*antarctica*).
Chevreux, 1913, p. 108.
Barnard, 1916, p. 148.
Chilton, 1923 (*Rec. Austr. Mus.*), p. 88.
Schellenberg, 1926, p. 308; 1931, p. 92.
Monod, 1926, p. 53, fig. 51.
Barnard, 1930, p. 338.

Occurrence: 1. St. 2. Ascension. 1 juv. 2·5 mm. from buoy.
2. St. 39. South Georgia. 1 ♂ 9 mm., 7 juv. 5–7 mm.
3. St. 42. South Georgia. 1 ♂ 11 mm.
4. St. 51. Falklands. 6 ♂♂ 7–10 mm., 5 ♀♀ (1 ovig.) 7–9 mm., 1 juv. 3 mm., from sponges.
5. St. 149. South Georgia. 3 ♂♂ 11–14 mm., 2 ♀♀ (1 ovig.) 13 mm., from sponge.
6. St. 170. South Shetlands. 1 ♂ 20 mm., 1 ♀ 18 mm.
7. St. 175. South Shetlands. 1 ♂ 21 mm.
8. St. 190. Palmer Archipelago (90–130 m.). 3 ♂♂ 8, 15 and 20 mm.
9. St. WS 27. South Georgia. 1 ♀ 10 mm., 2 juv. 4·5–6 mm.
10. St. MS 71. South Georgia. 1 ♂ 10 mm.

REMARKS. The minute specimen from Ascension has the postero-inferior angle of pleon segment 3 quadrate, and two small but definite denticles near the hinge on the palm of gnathopod 2 (cf. Chevreux and Fage, 1925, p. 123, fig. 119).

The colour of no. 3 is given as "yellowish semitransparent; penultimate segment of chela white, with terminal segment yellow; eyes pink"; and Note 145 for St. 190 gives it as "Ivory white with upper part of each thoracic and abdominal segment marbled with carnelian red (Ridgway, 7′ *R–O*), coxopodite of each thoracic leg with 2 longitudinal patches of the same colour. Eyes brown".

DISTRIBUTION. Cosmopolitan. In the Antarctic regions recorded from McMurdo Sound, South Orkneys, South Georgia, Palmer Archipelago and Marguerite Bay, 'Gauss' winter station.

Family SEBIDAE

Walker, 1907, p. 37.
Chevreux and Fage, 1925, p. 370.

Genus **Seba**, Bate.

Stebbing, 1906, pp. 162, 724.
Walker, 1907, p. 37.
Chilton, 1921 *a*, p. 56; 1924, p. 269.
Schellenberg, 1926, p. 309; 1931, p. 83.

Seba saundersii, Stebb. (Fig. 55).

Stebbing, 1888, p. 783, pl. xlix.
? Schellenberg, 1926, p. 309, fig. 34 (*dubia*).

Occurrence: St. 51. Falklands. 1 ♂ 3·5 mm., 3 ♀♀ 2·5–3 mm.

REMARKS. These specimens are clearly identical with the Challenger specimen, although the minute denticulation on the telsonic apex appears to be quite absent. The ♂ has slightly heavier gnathopods 1 and 2, the hand and finger of gnathopod 1 in ♂ shaped as in *antarctica*, and strongly expanded 4th joints of peraeopods 3–5. Eyes not visible.

Schellenberg's *dubia* appears very similar, especially as regards the telson, but the 2nd joint of peraeopods 3 and 4 is less expanded. His descriptions of the 1st and 2nd side-plates (coxae I and II) would seem to be transposed, as otherwise they apply to Stebbing's figure and to the present specimens. It is the *second* side-plate which has the sharp postero-inferior angle.

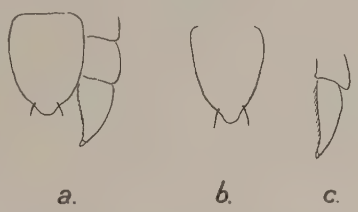

Fig. 55. *Seba saundersii*, Stebb. *a*. Telson and uropod 3 of ♂. *b*. Telson of ♀. *c*. Uropod 3 of ♀.

In both *typica* (Chilton) and *armata*, Chevr., the telson has a similar narrow oval form as in *saundersii* and *dubia*.

DISTRIBUTION. Off Cape Virgins; ? 'Gauss' winter station; ? South Africa.

Seba antarctica, Wlkr. (Fig. 56).

Walker, 1907, p. 37, pl. xiii, fig. 22.
Barnard, 1930, p. 339.

Occurrence: 1. St. 39. South Georgia. 6 ♂♂ 2·5–4 mm., 1 ♀ 3·5 mm.
2. St. 140. South Georgia. 6 ♂♂, 8 ♀♀ (some ovig.) 4·5–5 mm.
3. St. 142. South Georgia. Thirty-four specimens, ♂♂, ♀♀ (some ovig.) and juv. 2–3·5 mm. from sponge.

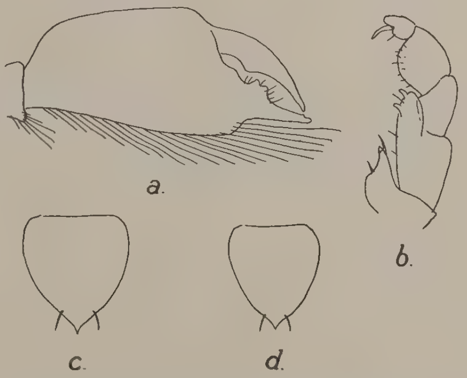

Fig. 56. *Seba antarctica*, Wlkr. *a*. Gnathopod of ♂. *b*. Maxilliped. *c*. Telson of ♂. *d*. Telson of ♀.

REMARKS. Walker's statement that the 'Discovery' (1901–4) ♀♀ "agree in the smallest detail" with Stebbing's description and figures of the 'Challenger' *saundersii*—a statement accepted by Chilton (1921) and Schellenberg (1926)—obviously belies his figures of the telson. From Chilton's remarks (*Ann. Mag. Nat. Hist.* (7), XVII, p. 571, 1906) it would seem that Walker at first identified his specimens with *saundersii*, and later changed the name in his note on Chilton's paper.

In this species the telson in both sexes is distinctly broader than in *saundersii*, with a sharper apex, the palp of maxilla 1 is stouter, and the postero-inferior angle of the *third* side-plate is quadrate (cf. Walker's figure, but in the present specimens the *antero*-inferior angle is rounded).

DISTRIBUTION. McMurdo Sound.

Family METOPIDAE

Stebbing, 1906, p. 171.

Excluding the genus *Thaumatelson*, the number of Antarctic and sub-Antarctic species of this family is now eighteen, including the two new species described below. A further increase is no doubt to be anticipated, as the family is represented in northern waters by a large number of species. Up to the present no representative of the typical genus *Metopa* has been found in southern waters. See also Schellenberg, 1931.

Genus **Metopella**, Sars.

Stebbing, 1906, p. 182.
Schellenberg, 1926, p. 313; 1931, p. 108.
Stephensen, 1927, p. 309.

Metopella ovata (Stebb.).

Stebbing, 1888, p. 764, pl. xliv; 1906, p. 183, figs. 47, 48.
Chilton, 1912, p. 481; 1923 (*Tr. N.Z. Inst.*, LIV), p. 241.
Schellenberg, 1926, p. 313; 1931, p. 108.
Stephensen, 1927, p. 309.

Occurrence: 1. St. 39. South Georgia. Five specimens, incl. 1 ovig. ♀, 2·5 mm.
2. St. 164. South Orkneys. Eleven specimens, incl. 7 ovig. ♀♀, 2·5–3 mm.
3. East Cumberland Bay. 30. xii. 26. 11–36 m. Fourteen specimens, incl. 9 ovig. ♀♀, 2·5–3 mm.

REMARKS. The colour (as preserved) is a pale greenish-grey, with numerous little round deeper greenish specks, chiefly on side-plates 2–4 (but see note on colour of *Kuphocheira setimanus*, *infra*, p. 239).

DISTRIBUTION. Magellan Straits; Falkland Islands; South Orkneys; Kerguelen; New Zealand and Campbell Islands.

Genus **Metopoides**, Della Valle.

Stebbing, 1906, p. 185.
Schellenberg, 1926, p. 318; 1931, p. 96.

Metopoides parallelocheir (Stebb.).

Stebbing, 1888, p. 762, pl. xliii; 1906, p. 186.

Occurrence: St. MS 67. South Georgia. Sixteen specimens, incl. ovig. ♀♀, 2–3·5 mm.

DISTRIBUTION. Cape Virgins, 100 m.

Genus **Proboloides**, Della Valle.

Stebbing, 1906, pp. 187, 725.
Walker, 1907, p. 18.
Schellenberg, 1926, p. 323.
Barnard, 1930, p. 339.

It seems to be clear that the beaded lower margin of side-plate 3 can be used as a generic character. It is far more satisfactory than the presence or absence of an accessory flagellum in antenna 1 for separating this genus from *Metopoides*.

The following key to the austral species may be useful.

I. Postero-inferior angle of pleon segment 3 produced and rounded, 2nd joint of peraeopod 3 not lobed on distal hind corner ... ... *typica*

II. Postero-inferior angle of pleon segment 3 quadrate, 2nd joint of peraeopod 3 lobed on distal hind corner.

  A. Hand of gnathopod 2 in ♂ with palm shorter than hind margin.
    1. Hand twice as long as broad ... ... *antarcticus*
    2. Hand not twice as long as broad ... ... *perlatus*

  B. Hand of gnathopod 2 in ♂ with palm longer than hind margin.
    1. Pleon segment 3 dorsally projecting ... ... *carinata*
    2. Pleon segment 3 not projecting.
      a. 2nd joint of peraeopods 4 and 5 oval ... ... *crenatipalmatus*
      b. 2nd joint of peraeopods 4 and 5 distally narrowed ... ... *porcellanus*

Proboloides typica (Wlkr.) (Fig. 57).

Walker, 1907, p. 20, pl. vi, fig. 10.
Schellenberg, 1926, p. 323, fig. 41.
Barnard, 1930, p. 339.

Occurrence: 1. St. 42. South Georgia. 1 ♂ 6 mm., 2 ♀♀ (1 ovig.) 7–7·5 mm., 7 juv. 3·5–6 mm.
2. St. 123. South Georgia. 1 ♀ with embryos 9 mm.
3. St. 144. South Georgia. 1 ♀ 7 mm.
4. St. 152. South Georgia. 1 ♀ 7·5 mm.
5. St. 160. South Georgia. 1 ♀ 7 mm.

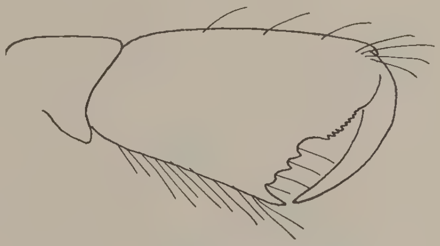
Fig. 57. *Proboloides typica* (Wlkr.). Gnathopod 2 of ♂.

Remarks. Gnathopod 1, 4th joint apically rounded, with long setae, and a thick brush of fine setules on lower margin, 5th elongate, lower margin with long setae, 6th not quite as long as (dorsal) length of 5th, narrower proximally, *swelling distally to form a transverse palm* with rounded angle bearing 3 spines. Gnathopod 2 in ♂, 2nd and 3rd joints strongly channelled on anterior margins as in *antarcticus*, 6th longer than broad, palm shorter than hind margin, with a flattish tooth near hinge, and 3–4 crenulations between the shallow median notch and the defining tooth; in ♀, 4th joint trapezoidal, lower apex acute, 5th lobed below, with several setae and a dense brush of setules, 6th large, subtriangular, palm subequal to or slightly shorter than hind margin, defined by an acute point within which are 2 stout spines, followed by a series of unequal rounded teeth.

Peraeopod 3 with 2nd joint not lobed on distal hind corner.

Postero-inferior angle of pleon segment 3 produced in a rounded lobe.

These specimens are not exactly like Walker's figures, but the differences in the gnathopods are not so great that they may not be ascribed to growth-changes.

Distribution. McMurdo Sound, 457 m.; 'Gauss' winter station, 385 m.

Proboloides antarcticus, Wlkr. (Fig. 58).

Walker, 1907, p. 18, pl. v, fig. 9 (gn. 2 ♂, labelled in error "gn. 2 ♀").

Occurrence: St. 195. South Shetlands. 1 ♂ 7 mm.

Remarks. Agrees with Walker's figure of the ♂, except that the hand of gnathopod 2 is longer, equal to the length of the 2nd joint, and the conical tooth is midway in the palmar excavation between the square-topped crenate tooth near hinge and the defining tooth. Anterior margin of 2nd and 3rd joints of gnathopod 2 channelled, with strong distal lobes. Side-plate 3 with beaded margin as in the other species.

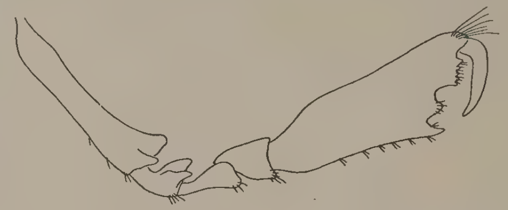

Fig. 58. *Proboloides antarcticus*, Wlkr. Gnathopod 2 of ♂.

Contrary to the opinion expressed in the Terra Nova Report, I now think that *perlatus* will prove to be a form distinct from *antarcticus*, and that both are distinct from *crenatipalmatus*.

Distribution. McMurdo Sound.

Proboloides carinata (Schell.) (Fig. 59).

Schellenberg, 1931, p. 101, fig. 54.

Occurrence: 1. St. 42. South Georgia. 1 adult ♂ 9 mm., 3 immat. ♂♂ 5–6 mm.
2. St. 123. South Georgia. 1 ♂ 8 mm.

Description. Deceptively like *crenatipalmatus* on first glance at the 2nd gnathopods, but at once distinguished by the upstanding apex of pleon segment 3. Side-plate 3 beaded on lower margin. Postero-inferior angle of pleon segment 3 quadrate. Gnathopod 1, 5th joint relatively longer, 6th relatively shorter, the latter parallel-sided, not distally expanded, palm oblique, setose. Gnathopod 2, notch on palm nearly semicircular in immature ♂, and in adult much more open, i.e. it does not undercut the tooth adjoining the tooth which defines the palm, tooth near the hinge with stronger denticles than in *crenatipalmatus*. Peraeopod 3, 2nd joint distally lobed. Telson and upper margin of uropod 3 with fewer spines than in *crenatipalmatus*.

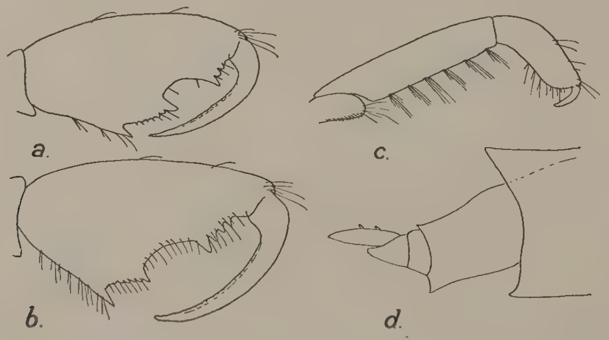

Fig. 59. *Proboloides carinata* (Schell.). *a*. Gnathopod 2 of immature ♂. *b*. Gnathopod 2 of adult ♂. *c*. Gnathopod 1. *d*. Pleon segments 3–6.

Proboloides crenatipalmatus (Stebb.) (Fig. 60).

Stebbing, 1888, p. 759, pl. xlii (♀); 1906, p. 188.

Occurrence: 1. St. 42. South Georgia. 3 ♂♂ 11–13 mm., 3 immat. ♂♂ 8–10 mm.
2. St. 123. South Georgia. 1 ovig. ♀ 11 mm.
3. St. 140. South Georgia. 9 ♂♂ 10–11 mm., 4 ♀♀ (1 ovig.) 10 mm., 2 juv. 6 and 8 mm.
4. St. 144. South Georgia. 1 ♂ (anterior half only).
5. St. 152. South Georgia. 1 immat. ♂ 7 mm.

DESCRIPTION ♂. Resembling ♀, side-plate 3 beaded as in the other species, antenna 1 with flagellum 20-jointed, no accessory flagellum, antenna 2 with flagellum 16-jointed.

Gnathopod 1, 6th joint shorter than 5th, of same shape as in *typica* but stouter, palm with 3–4 spines near lower corner. Gnathopod 2 much stronger than in ♀; in immature ♂ 6th joint ovate, palm longer than hind margin, defined by an acute point, with a notch bounded by two teeth in middle, rest of palmar margin smooth or feebly crenulate; in adult ♂ palm still longer relatively to hind margin, defined by an acute tooth, with a large angular notch in the middle separating a proximal tooth or cutting edge and a distal tooth near hinge.

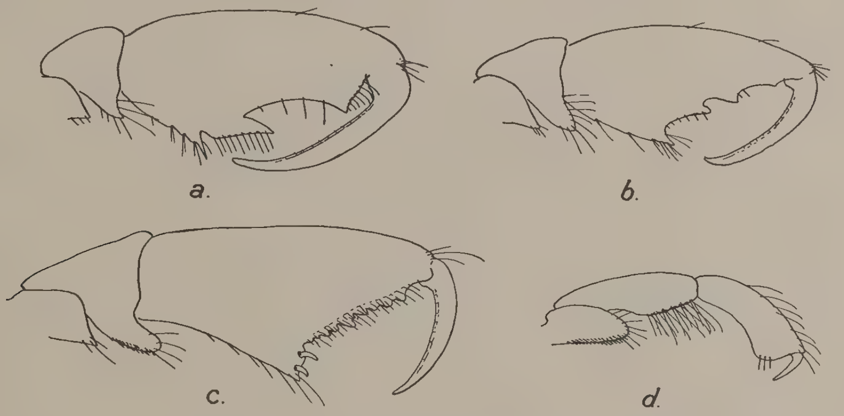

Fig. 60. *Proboloides crenatipalmatus* (Stebb.). *a*. Gnathopod 2 of adult ♂. *b*. Gnathopod 2 of immature ♂. *c*. Gnathopod 2 of adult ♀. *d*. Gnathopod 1.

Peraeopod 3 with 2nd joint distally lobed as in ♀.

REMARKS. Stebbing's specimen would seem to have been an immature one. The 2nd gnathopod of the present ♀ is here figured for comparison. The 1st gnathopod in ♀ is likewise stronger than in Stebbing's figure, the palm is slightly more transverse, and the joint is definitely wider distally than proximally.

DISTRIBUTION. Magellan Strait; Tristan da Cunha.

Proboloides porcellanus, n.sp. (Fig. 61).

Occurrence: St. 51. Falklands. Fifty-three specimens 5–9 mm., incl. ♂♂, ovig. ♀♀ and juv., from pharynx of large Ascidian.

Description. Side-plate 3 minutely beaded on lower margin. Postero-inferior angle of pleon segment 3 quadrate.

Gnathopod 1, 6th joint not quite as long as 5th, ovate, no distinct palm, lower margin with marginal spines and numerous setae. Gnathopod 2, 2nd and 3rd joints channelled in front, with rounded lobes distally, 5th bluntly lobed below, the lobe not produced, no brush of fine setae, but with a few long setae, and a graduated row of spines on distal margin, 6th ovate, palm longer than hind margin, in ♂ with a flat tooth near hinge followed by a small notch, another notch in front of the shortly produced defining angle, in ♀ minutely crenulate, with a small median notch.

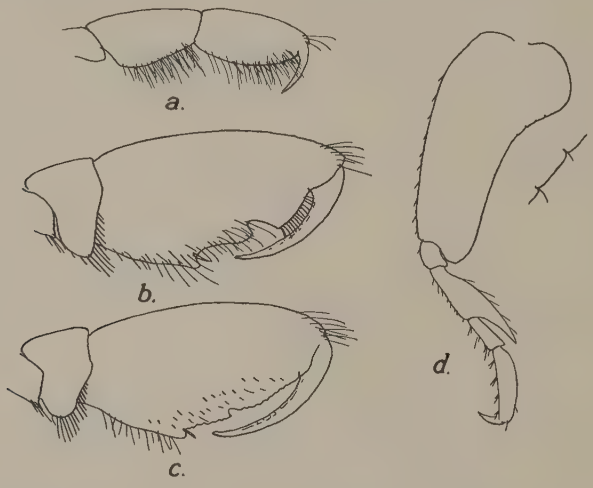

Fig. 61. *Proboloides porcellanus*, n.sp. *a*. Gnathopod 1. *b*. Gnathopod 2 of ♂. *c*. Gnathopod 2 of ♀. *d*. Peraeopod 5, with portion of hind margin of 2nd joint further enlarged.

Peraeopod 3, 2nd joint narrow linear, but hind distal angle produced in a short rounded lobe. Peraeopods 4 and 5, 2nd joint expanded at base, then rapidly narrowing, somewhat like that of *Metopella neglecta* (Sars, pl. xcvii, fig. 2), but the proximal expansion not extending half-way down the joint, 4th joint moderately expanded.

Telson and uropod 3 unarmed.

Remarks. This species is at once distinguished by the excavate hind margins of 2nd joints of peraeopods 4 and 5. The beading on side-plate 3 is much finer and more close-set than in the other species. The colour (as preserved) is an opaque creamy white like porcelain.

Genus **Thaumatelson**, Wlkr.

Walker, 1907, p. 21.
Chilton, 1912, p. 481.
Chevreux, 1913, p. 109.

Thaumatelson nasutum, Chevr.

Chevreux, 1912, p. 5; 1913, p. 109, figs. 16–18.
Chilton, 1912, p. 483, pl. i, figs. 16, 17 (*inermis*).

Occurrence: 1. St. MS 67. South Georgia. Twenty-six specimens, incl. ovig. ♀♀, 2–2·75 mm.
2. St. MS 74. South Georgia. Eleven specimens, incl. ovig. ♀♀, 2–2·5 mm.
3. East Cumberland Bay, South Georgia. 30. xii. 26. 11–36 m. Twenty-eight specimens, incl. ovig. ♀♀, 2–2·5 mm.

REMARKS. Chilton in a footnote says his species may be the same as Chevreux's, but refers to the difference in the mandibular palp. The difficulty of determining whether the mandibular palp is really degenerate, makes it inadvisable to recognize two species separated by such a minute difference. One of the present specimens was dissected, and one could not be certain that the palp was 3-jointed; even Chevreux's figure shows a little nick on both sides of the palp, indicating the junction of the 1st and 2nd joints.

DISTRIBUTION. Petermann Island, 3 m.; South Orkneys, 9–10 fathoms.

Thaumatelson cultricauda, n.sp. (Fig. 62).

Occurrence: St. MS 67. South Georgia. 1 ovig. ♀ 3 mm.

DESCRIPTION. Close to *walkeri*, Chilton. Pleon segment 3 with a posterior medio-dorsal tooth, slightly turned up but not upstanding, flanked on each side by a much smaller blunt denticle. Telson elongate, apically slightly upturned, dorsal edge sharp, not thickened.

Antenna 1, 1st joint produced on upper apex.

Gnathopod 1 similar to that of *walkeri*, but 6th joint more slender, twice as long as broad. Gnathopod 2 similar to that of *walkeri*, but 6th joint parallel-sided, $2\frac{1}{2}$ times as long as wide.

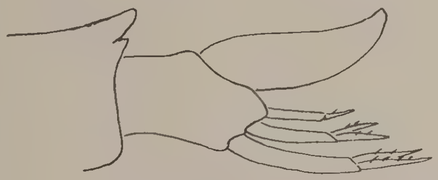
Fig. 62. *Thaumatelson cultricauda*, n.sp. Pleon segments 3–6 and telson.

REMARKS. This may prove to be the ♀ of *walkeri*, but Chilton did not state the sex of the specimens he examined. The telson, however, would seem to indicate a separate species.

Family STENOTHOIDAE

Stebbing, 1906, pp. 192, 725.

Genus **Stenothoë**, Dana.

Stebbing, 1906, pp. 192, 725.

Stenothoë sp.

Occurrence: St. 5. Tristan da Cunha. 2 ♀♀ (1 ovig.) 2–3 mm.

REMARKS. As both specimens are ♀♀ the species is unidentifiable, but a brief résumé of the characters may be given.

Back not carinate. Eyes present. Maxilliped with the 4 joints of the palp together equal to the length of the outer plate, 1–3 broad and stout, 3rd bulbous, 4th rapidly narrowing from a broad base to a fine acute point. Gnathopod 1, 4th joint produced to end of 5th. Palm defined in both gnathopods. Peraeopod 3, 2nd joint narrow. Fourth joints of peraeopods 3–5 widened and produced. Peduncle of uropod 3 subequal to ramus, of which the 2nd joint is straight. Telson with two spines on either side.

Family COLOMASTIGIDAE

Stebbing, 1906, p. 206.

Genus **Colomastix**, Grube.

Stebbing, 1906, p. 206.
Chilton, 1921 *a*, p. 60.
Barnard, 1925, p. 346.
Chevreux and Fage, 1925, p. 144.
Schellenberg, 1926, p. 324.

When Schellenberg described his new species it seemed justifiable to regard Walker's (1907) record of *pusilla* and Chilton's (1912) record of *brazieri*, from McMurdo Sound and the South Orkneys respectively, as being referable to *fissilingua*, Schell. But the discovery of a further species from Antarctic waters makes it a little uncertain, without re-examination of the specimens, to what species they did really belong. One can, however, feel confident that they are neither *pusilla* nor *brazieri*.

In retracting my opinion (1925) that *brazieri* would eventually be united with *pusilla*, I fully concur with Schellenberg that when abundant material from many localities has been properly examined, *pusilla* itself will be broken up into more than one species. The real shape of the telson of *brazieri* is still unknown.

Colomastix fissilingua, Schell. (Fig. 63).

Schellenberg, 1926, p. 324, fig. 42; 1931, p. 114.
? Walker, 1907, p. 38 (*pusilla*, *non* Grube).
? Chilton, 1912, p. 484 (*brazieri*, *non* Haswell).

Occurrence: 1. St. 39. South Georgia. 13 ♀♀ (3 ovig.) 2·5–4 mm.
2. St. WS 27. South Georgia. 1 ♂ 3 mm., 1 juv. 2 mm.

REMARKS. In *fissilingua* we have a species undoubtedly distinct from *pusilla*; the telson alone is a sufficient distinction. The present specimens agree with Schellenberg's description. I give some figures, however, including one of gnathopod 2 in ♀. The

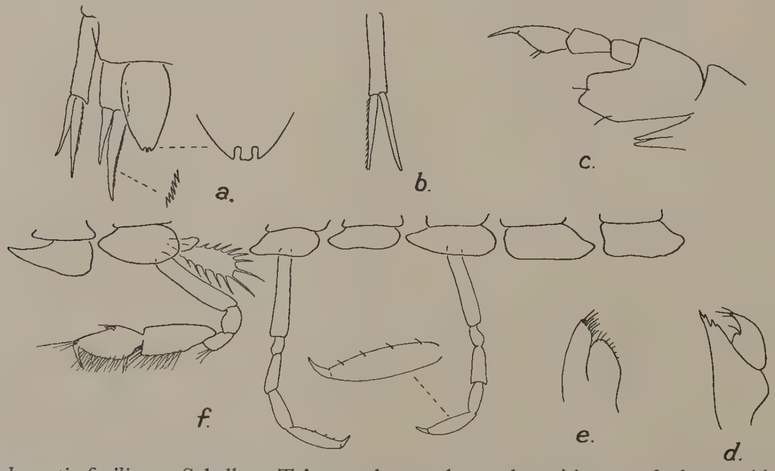

Fig. 63. *Colomastix fissilingua*, Schell. *a*. Telson and uropods 2 and 3, with apex of telson and inner margin of inner ramus of uropod 3 further enlarged. *b*. Uropod 1. *c*. Maxilliped. *d*. Maxilla 1. *e*. Maxilla 2. *f*. Side-plates 1–7, with gnathopod 2 (♀), peraeopods 1 and 3, and 6th joint of peraeopod 3 further enlarged.

lower lip lacks inner lobes. The 2nd joints of peraeopods 1–5 are slender and quite distinct from those of *brazieri*.

DISTRIBUTION. Kerguelen; 'Gauss' winter station. Probably also McMurdo Sound and South Orkney Islands.

Colomastix castellata, n.sp. (Fig. 64).

Occurrence: St. 51. Falklands. 1 immat. ♂ 2·5 mm., 1 ovig. ♀ 4 mm. from sponge.

DESCRIPTION. Closely resembling *fissilingua*, but distinguished by the shorter telson with its castellated margin, and the stouter peduncles of the uropods, especially that of uropod 3, which is scarcely longer than wide.

Gnathopod 2 of the ♀ resembles that of *fissilingua* as here figured. Gnathopod 2 of the ♂, which is evidently not fully adult, is stouter, 5th joint triangular, but not so short as in the full-grown *pusilla*, 6th joint oval, palm oblique, distinguished from hind margin only by its armature of setae, finger short and stout. The inner lobes of the maxilliped are apically separate as in *fissilingua*.

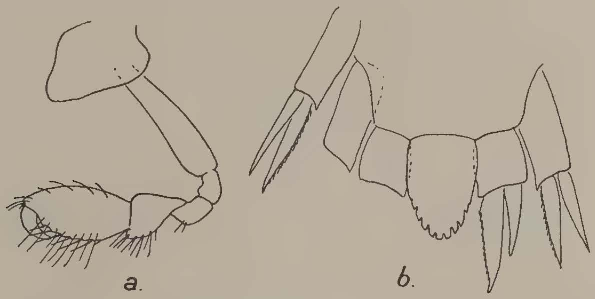

Fig. 64. *Colomastix castellata*, n.sp. *a*. Gnathopod 2 of ♂. *b*. Telson and uropods 1–3.

REMARKS. There is no need to defend the specific status of this form; its own castellated telson is sufficient. In all the 15 specimens of *fissilingua*, which I have examined, there is no hint of a multiplication of the marginal slits on the telson. Moreover, the telson is different in shape in the two species, and the difference in the peduncle of uropod 3 is quite appreciable.

Family ACANTHONOTOZOMATIDAE

Stebbing, 1906, p. 210.
Barnard, 1930, p. 345 (references).

This family is far better represented in the southern hemisphere, especially in the Antarctic and sub-Antarctic regions, than in the northern hemisphere. Every successive Antarctic expedition has brought back additional examples of known forms as well as new forms.

There is evidently a great variety of forms in the Antarctic regions, but it is as yet impossible to say whether this variety is due to variation within specific limits. In the study of the Discovery collection more difficulties have presented themselves than in the case of the Terra Nova collection. Some of the views on synonyms expressed in that report (1930) have been changed, and I cannot claim that even now the conceptions of the different species have reached a satisfactory finality.

A detailed analysis of the members of this family should prove an interesting study to one favoured with the opportunity of making direct comparisons of all the Antarctic material now available in Europe. One of the essentials of such a study will be the comparison of the mouth-parts.

As regards variation, some details were given in the Terra Nova Report, viz. the anterior side-plates in certain species. The integumentary processes may be divided into primary and secondary armature. For example, the denticles on the peraeon and pleon of *E. echinata* (recorded in the report referred to as *nodosa*) may be termed secondary armature; and this armature is subject to considerable variation.

On the other hand, the paired dorsal processes and the medio-dorsal carinal teeth may be termed primary armature; this appears to be subject to very little variation and to be truly specific in character. It can be safely asserted that the number of paired dorsal processes does not increase with age. I have examined all available embryos (or rather juveniles) in the brood-pouches, and find that the number does not differ from that of the adult, with the one exception of *Acanthonotozomella oatesi*.

The following synopsis based on the paired dorsal processes may facilitate identification:

No paired dorsal processes	*Pariphimedia normani* (Cunn.)
One pair ,, ,, ...	*Pariphimedia integricauda*, Chevr.
Three pairs ,, ,, ...	"*Iphimedia*" *pacifica*, Stebb. *Iphimediella bransfieldi*, n.sp. *Gnathiphimedia sexdentata* (Schell.) *G. macrops*, n.sp. *Maxilliphimedia longipes* (Wlkr.) *Anchiphimedia dorsalis*, Brnrd. *Panoploea joubini*, Chevr. *P. macrocystidis*, n.sp.
Four pairs ,, ,, ...	*Iphimediella margueritei*, Chevr. *I. cyclogena*, Brnrd. *I. microdentata*, Schell.[1] *I. rigida*, Brnrd. *I. nodosa* (Dana) *Gnathiphimedia mandibularis*, Brnrd. *Labriphimedia vespuccii*, Brnrd.
Five pairs ,, ,, ...	"*Iphimedia*" *serrata*, Schell. *Labriphimedia pulchridentata* (Stebb.)
Eleven pairs ,, ,, ...	*Acanthonotozomella oatesi*, Brnrd.

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[1] In the Terra Nova Report I placed *microdentata*, Schell., as a synonym of *margueritei*, Chevr. Dr Schellenberg has informed me, however, that *microdentata* is the same as my *brevispinosa* and thus has dorsal processes quite unlike those of *margueritei*. My mistake was, I think, pardonable, as the description of *microdentata* said that it resembled *margueritei* in habitus and no mention was made of the dorsal processes. *I. brevispinosa*, therefore, on Schellenberg's authority, becomes a synonym of *microdentata*.

The three species of *Echiniphimedia* are omitted from the above list; *Acanthonotozomella alata*, Schell., has only medio-dorsal carinal teeth.

Another point which needs investigation is the imbrication of the lower margins of the peraeon segments over the bases of the respective side-plates, and the consequent formation of a lateral keel. Is this primary or secondary armature; is it specific or varietal?

Genus **Acanthonotozomella**, Schell.

Schellenberg, 1926, p. 332.
Barnard, 1930, p. 346.

Acanthonotozomella oatesi, Brnrd. (Fig. 65).

Barnard, 1930, p. 346, figs. 20, 21.

Occurrence: 1. St. 39. South Georgia. 1 ♂ 9 mm.
2. St. 144. South Georgia. 1 ♀ 7 mm.
3. St. 156. South Georgia. 1 ♂ 7 mm.
4. St. 190. Palmer Archipelago (90–130 m.). 1 ♂ 6·5 mm.
5. St. WS 33. South Georgia. 1 ♀ with embryos 9 mm.

Remarks. Whereas the specimens from St. 156 and 190 (the latter from a locality nearest to the original locality) are nearly typical examples, the others show some noteworthy variations. Even in those from St. 156 and 190, the 1st peraeon segment is slightly broader than in the Terra Nova specimens, and the dorsal processes have broader bases, occupying the whole extent of the segment. In the other specimens the 1st segment is dorsally lengthened, and the two processes are confluent in front, divergent behind, and thus enclose a concave space which when seen from above is triangular in shape. This development is most marked in no. 2 (Fig. 65 *a*). All the dorsal processes appear to have a tendency to vary in length. Those on peraeon segments 2–4 are often distinctly shorter and more slender than in typical examples; and in no. 1 they are absent altogether, these three segments having merely a transverse ridge on the hind margin, with squarish corners when seen in cross-section (Fig. 65 *b*).

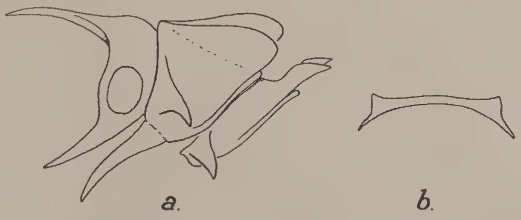

Fig. 65. *Acanthonotozomella oatesi*, Brnrd. *a*. Head of ♀ from St. 144. *b*. Cross-section of peraeon segment 3 of ♂ from St. 39.

The embryos from the brood-pouch, 2·5 mm. in length, possess no spiny armature, except a pair of short adpressed dorsal processes on peraeon segment 7 and pleon segments 1–4.

The label of no. 3 says, "with the Gastropod in which it was found". The mollusc with its operculum, however, is still in the shell, so that the presence of the Amphipod in the mouth of the shell can only be regarded as accidental.

Distribution. Ross Sea, 82–92 m.

Genus Iphimedia, Rathke.

Stebbing, 1906, p. 214; 1914, p. 584.
Barnard, 1930, p. 346.

Iphimedia capicola, n.sp. (Fig. 66).

Occurrence: St. MS 82. South Africa. 1 ♂ 4·5 mm.

Description. Rostrum acute, curved downwards. Eyes oval, reddish. Peraeon segments 1 and 7 much longer than any of the others. Side-plates 1–4 acute below, postero-inferior angles of 5 and 7 rounded, of 6 subquadrate. Peraeon 7 and pleon segments 1–3 each with a pair of procumbent dorsal teeth, pleon segments 1–3 being also medio-dorsally keeled. Postero-inferior angle of pleon segment 1 rounded, of 2 quadrate, of 3 acutely produced; posterior margin of segment 3 with an acute upturned lateral tooth well above the postero-inferior angle. Telson oval, apex incised, a small denticle near apex on outer margin.

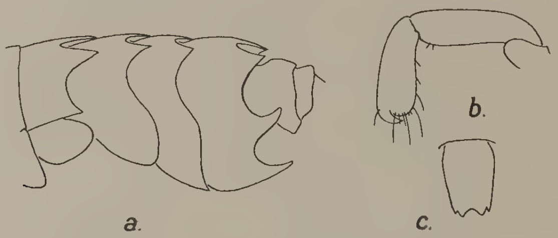

Fig. 66. *Iphimedia capicola*, n.sp. *a.* Peraeon segment 7 and pleon segments 1–5. *b.* Gnathopod 2. *c.* Telson.

Antenna 1, upper apex of 1st joint with one short tooth, lower apex with two teeth, upper and lower apices of 2nd joint both shortly produced, flagellum 12-jointed. Antenna 2, flagellum 16-jointed. Mouth-parts as in *obesa* (Sars, 1895, pl. cxxxii).

Gnathopod 1 slender, chelate, 5th and 6th joints subequal, longer than 3rd. Gnathopod 2 subchelate, 3rd and 6th joints subequal, a little shorter than 5th, 6th widening slightly to the rounded palm.

Peraeopod 3, 2nd joint with upper hind angle quadrate, the lower rounded. Peraeopods 4 and 5, 2nd joints with upper hind angles rounded, lower angle in peraeopod 4 quadrate with a small point, in peraeopod 5 rounded-quadrate.

Uropods unarmed, except inner margin of outer ramus of uropod 3 which is very minutely setulose.

Remarks. This is the first record of this genus in South African waters, as Dana's *Iphimedia capensis* is a *Paramoera*. The species is close to *obesa* and to the Australian *discreta*, Stebb. 1910, but the 6th joint of gnathopod 2, position of the lateral tooth on pleon segment 3, and the telson are distinguishing marks.

Genus **Iphimediella**, Chevr.

Chevreux, 1913, p. 119.
Barnard, 1930, p. 348.

I am now inclined to place *I. pacifica*, Stebb., in this genus, and also, as shown below, *nodosa*, Dana.

Iphimediella margueritei, Chevr.

Chevreux, 1913, p. 120, figs. 22–24.
Barnard, 1930, p. 348, fig. 22.

Occurrence: 1. St. 42. South Georgia. 1 juv. 7·5 mm.
2. St. 175. South Shetlands. 1 ♀ 15 mm.
3. St. MS 71. South Georgia. 1 ♀ 16 mm.

REMARKS. In all these specimens the side-plates 1–3 are of the form figured in the Terra Nova Report. *I. microdentata*, Schell., is not a synonym of this species (see note *supra*, p. 116).

DISTRIBUTION. Graham Land, 200 m.; 'Gauss' winter station, 385 m.; McMurdo Sound, 256–457 m.

Iphimediella bransfieldi, n.sp.

Occurrence: St. 175. South Shetlands. 2 ovig. ♀♀ 14 and 22 mm.

DESCRIPTION. Very like *rigida*, Brnrd., but with only three pairs of dorsal processes, viz. on peraeon segment 7 and pleon segments 1 and 2; and the dorsal keel on pleon segments much feebler (in the smaller specimen obsolete), especially on segment 4 where there is no upstanding tooth. Lateral margin of head as figured for *brevispinosa* Brnrd., but in the smaller specimen the lower tooth is longer. Side-plate 1 oblong in the larger specimen, apically truncate and concave, the antero-inferior angle rounded; in the smaller specimen narrowing slightly below to an almost bidentate apex.

Antenna 1 with one tooth on anterior margin of the long spinous tooth on 1st joint, which extends only to end of 2nd joint. Mandible with apex bidentate, but there are 3–4 accessory denticles, secondary cutting plate in left mandible clavate. Maxilliped, 2nd joint of palp expanded, but scarcely produced along inner margin of 3rd joint.

REMARKS. The antero-lateral margin of the head with its narrow notch, as well as the mandibles, preclude this form from being by any chance the form described by Schellenberg as *sexdentata*.

From *Maxilliphimedia longipes* (Wlkr.), which it closely resembles in dorsal armature, it is distinguished by the anterior margin of the head and pre-eminently by the mouthparts.

Iphimediella nodosa (Dana) (Fig. 67).

Bate, 1862, p. 125, pl. xxiii, fig. 1 (after Dana).
Della Valle, 1893 (*F. u. Fl. Golf. Neap.*), p. 583, pl. lviii, figs. 89, 90.
Stebbing, 1906, p. 216; 1914, p. 358.
Chevreux, 1913, p. 118.
Non Barnard, 1930, p. 361 (= *echinata*).

Occurrence: St. WS 85. Falklands. 1 ♀ with embryos 7·5 mm.

Description. Head with a small notch between two short subacute points at the antero-inferior angle. Peraeon segments 1–6 dorsally smooth; segment 7 with a pair of short dorsal processes, flanked by a smaller dorso-lateral tooth.. Postero-inferior angles of segments 1–4 rounded, of 5 subacute, of 6 and 7 produced backwards in a small (segment 6) or large (segment 7) point. Peraeon segments not imbricate below. Side-plates 1–3 rounded below, 4 subacute below, lower margin not deeply excavate; 5–7 ending behind in small points, largest on 7. Pleon segments 1–3 each with a pair of dorsal processes, flanked on segments 1 and 2 by a smaller tooth, and a strong medio-dorsal carina which ends posteriorly in a more or less acute tooth; segment 4 with a slight dorsal depression; lateral margins of segments 1–3 with a more or less upturned tooth; postero-inferior angles of segments 1 and 2 also with an upturned tooth; dorso-lateral keels on segment 6 ending bluntly. Telson ovate-oblong, slightly incised, lobes rounded.

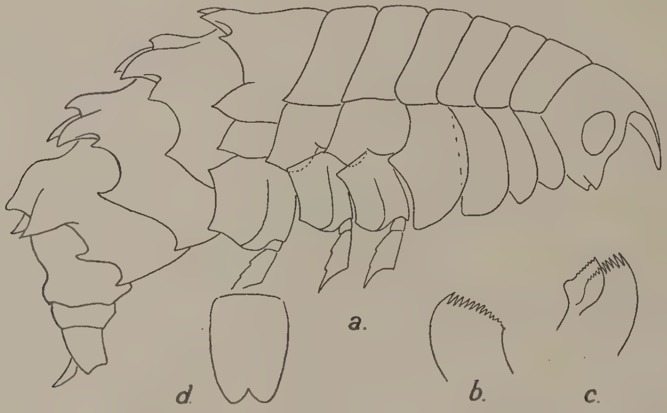

Fig. 67. *Iphimediella nodosa* (Dana). *a*. General view. *b* and *c*. Right and left mandibles respectively. *d*. Telson.

Antenna 1, 1st joint with two very short teeth on inner distal margin, 2nd joint also with one very short tooth on inner upper apex. Upper lip longer than broad, incised, but not deeply (not so deeply as the telson). Mandible, cutting edge with numerous graduated teeth, secondary cutting-plate in left mandible only, broad, multidentate, no spine-row or molar (cf. Della Valle, pl. lviii, fig. 89). Maxilla 1, palp rather strong (cf. Della Valle, pl. lviii, fig. 90). Maxilliped, 2nd joint of palp slightly expanded distally, but scarcely produced (cf. *pacifica*, Stebb., 1888, pl. lxxi, or 1906, fig. 55).

Peraeopods 3–5, 2nd joints broadly expanded, hind margin with a short point at upper angle, and a stronger one at lower angle in peraeopod 5, but only a mere indication in peraeopods 3 and 4.

Uropod 2, outer ramus two-thirds length of inner ramus.

Remarks. This specimen reopens the question of the identity of *echinata*, Wlkr., *nodosa*, Dana, and *nodosa*, Stebb. In spite of the complete absence of denticles on peraeon segments 4–6, and the absence of a lateral carina (imbrication) even on segments 5–7, in this specimen, it is obvious that it should be identified with Stebbing's *nodosa*, which also came from the Falkland Islands. The mouth-parts and the absence of the serrate tooth on the 2nd joint of antenna 1, as well as the dorsal armature, absolutely prevent the inclusion of the present specimen with typical *echinata*.

In discussing these forms in the Terra Nova Report, I took the view that the posterior dorsal tooth on pleon segments 1–3 in Dana's figure (copied in Bate) represented a *medio-dorsal carinal* tooth, not one of a pair of teeth, and that therefore *echinata* was merely a more spinose form of *nodosa*, Dana. The present specimen, however, bears such a strong resemblance to Dana's figure, crude as it is, that one's confidence is considerably shaken with regard to the identity of *echinata* with *nodosa*.

Unless Dana's type specimen is still available, the matter can never be satisfactorily settled, and it might be as well to ignore *nodosa*, Dana, completely, recognizing *echinata* and the Falkland Islands form for which a new name would then be necessary. This course may not appeal to all authors and therefore it may be best to follow Stebbing and identify the Falkland Islands form with *nodosa*, Dana, adding Stebbing as *auct. emendans*. As Chevreux quotes Stebbing (1906) one assumes that his specimen corresponded exactly with Stebbing's description.

The structure of the mouth-parts would seem to indicate that this form is more correctly placed in the genus *Iphimediella*. See Schellenberg, 1931, p. 119, pl. 1, fig. *a* and text-fig. 64.

DISTRIBUTION. Hermite Island; Cape Virgins; Falkland Islands; Magellan Strait.

Genus **Gnathiphimedia**, Brnrd.

Barnard, 1930, p. 352.

Gnathiphimedia mandibularis, Brnrd.

Barnard, 1930, p. 352, fig. 26.

Occurrence: 1. St. 27. South Georgia. 1 juv. 4·5 mm.
2. St. 123. South Georgia. 1 ♀ 11·5 mm., 2 ovig. ♀♀ 14–15 mm.
3. St. 140. South Georgia. 6 ♂♂ 7–10 mm.
4. St. 144. South Georgia. 2 ♀♀ 10·5–12·5 mm., 1 ovig. ♀ 11·5 mm.
5. St. 145. South Georgia. 1 ♂ 11·5 mm.
6. St. 148. South Georgia. 1 ♀ 11·5 mm.
7. St. 159. South Georgia. 2 ♀♀ (1 with embryos) 13 mm.
8. St. WS 33. South Georgia. 1 ♂ 8 mm., 1 ♀ 10 mm.
9. St. MS 71. South Georgia. 1 ♀ with embryos 12 mm.

REMARKS. Though the adults are considerably smaller than the Terra Nova examples, in fact suspiciously like *margueritei*, I see no differences in them except that side-plates 1–3 are more or less narrowed below and bifid, and thus approximate to the form of those of typical *margueritei*; the mandibles are not so heavily chitinized or so blunt apically as in the large Terra Nova specimens, but distinctly heavier than in the specimens here referred to *margueritei*; the characteristic wide notch between the two sharp points on the head is present in all these specimens.

DISTRIBUTION. Oates Land, 329–66 m.; McMurdo Sound, 348–547 m.

Gnathiphimedia sexdentata, Schell.

Schellenberg, 1926, p. 331; 1931, p. 116.
Barnard, 1930, pp. 353, 449, fig. 27 (*pacifica*, *non* Stebb.).
? Walker, 1907, p. 27 (*pacifica*, *non* Stebb.).
? Chevreux, 1913, p. 118 (*pacifica*, *non* Stebb.).

Occurrence: 1. St. 123. South Georgia. 1 ♂ 10 mm., 1 ♀ 11 mm.
2. St. 148. South Georgia. 1 ♀ 11 mm.
3. St. 149. South Georgia. 1 ♀ 9 mm., 1 ovig. ♀ 11 mm.
4. St. 156. South Georgia. 1 ♂ 10 mm.
5. St. 170. South Shetlands. 1 ♀ 11·5 mm.
6. St. 175. South Shetlands. 1 ♂ 11·5 mm., 1 ♀ 13 mm.
7. St. 190. Palmer Archipelago (90–130 m.). 1 ♂ 11·5 mm.
8. St. 190. Palmer Archipelago (315 m.). 1 ♂ 13 mm., 1 ♀ 15 mm.

REMARKS. These specimens are all smaller than those of the Terra Nova collection, but otherwise they are in agreement. In most the side-plates 1 and 2 are as figured (1930), but in some cases side-plate 1 is truncate and slightly concave below, and side-plate 2 is subtruncate. There is no trace of a dorsal keel on pleon segments 1–3.

I am now convinced that neither the Terra Nova nor the Discovery (1925–7) specimens should be identified with *pacifica*, Stebb. There can be little doubt that Walker's specimens, also from McMurdo Sound, are the same as the Terra Nova specimens; and in all probability the Pourquoi Pas specimens from Marguerite Bay should also be referred to *sexdentata*.

DISTRIBUTION. 'Gauss' winter station, 385 m.; McMurdo Sound, 256–547 m. Probably also Marguerite Bay, 50–200 m.

Gnathiphimedia macrops, n.sp. (Fig. 68).

Occurrence: St. 42. South Georgia. 1 ♂ 11·5 mm.

DESCRIPTION. Resembling *sexdentata* (cf. Barnard, 1930, fig. 27, as *pacifica*) as regards the dorsal armature and gibbous pleon segment 3, and 2nd joints of peraeopods 3–5. Antero-lateral margin of head with a narrow notch separating a rounded tooth above and a long acute tooth below. Eyes very large. Side-plate 1 oblong, lower margin concave, denticulate; side-plates 2–4 serrulate on lower anterior margins. Mandibular apex obtusely conical, strongly chitinized.

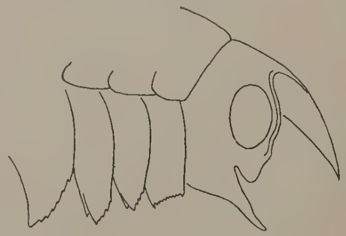
Fig. 68. *Gnathiphimedia macrops*, n.sp. Head with side-plates 1–4.

REMARKS. Chevreux (1913) found the eyes of *I. margueritei* much larger in ♂ than in ♀. In the same species from the Terra Nova collection I found the eye in the ♂ slightly larger than in the ♀; but in no other species in that collection, nor in any of those in the present collection, is there any appreciable difference in the size of the eyes in the two sexes. I am therefore inclined to regard the large eye in the present form as a specific character, though the specimen happens to be a ♂.

Apart from the size of the eye, the antero-lateral margin of the head forms a good distinguishing character.

The colour is given as "white and semitransparent with a pair of patches of brown chromatophores at base of foremost pair of dorsal spines; other scattered brown chromatophores at base of other dorsal spines and on basal segments of legs and antennae; eyes pink".

Genus **Anchiphimedia**, Brnrd.

Barnard, 1930, p. 357.

Anchiphimedia dorsalis, Brnrd.

Barnard, 1930, p. 357, figs. 29, 30.

Occurrence: St. 187. Palmer Archipelago. 1 ♂ 12·5 mm.

REMARKS. The tooth on the postero-lateral margin of pleon segment 3 and that on the postero-inferior angle of the same segment are both longer and more upturned, and the excision between the former and the gibbous dorsal apex of the segment is less angular.

The dorsal processes are markedly thick or even somewhat clavate, not like the evenly tapering processes of other species. In other respects the specimen is quite typical.

DISTRIBUTION. McMurdo Sound, 547 m.

Genus **Labriphimedia**, Brnrd.

Barnard, 1931, p. 427.

Epistome short and broad. Upper lip transverse, much broader than long, not incised. Mandible tapering to a smooth, symmetrical, spoon-shaped apex, secondary cutting-plate present or absent, molar rudimentary, no spine-row. Lower lip without inner lobes, outer lobes not apically incised. Maxilla 1 with stout 2-jointed palp which extends beyond apex of outer plate. Maxilliped with inner plate moderately broad, outer plate broad, palp rather slender, 2nd joint neither expanded nor apically produced.

REMARKS. In the Terra Nova Report (p. 358) I assigned *Iphimedia pulchridentata*, Stebb., to the genus *Echiniphimedia* in spite of certain details in the mouth-parts. The discovery of the species described below, which agrees with *pulchridentata* in the general shape of the mandible and maxilliped, as well as in the short broad labrum, clearly indicates that both should be placed in a new genus.

Among several types of mandible found in the members of this family the peculiar scoop-like apices of the present form are quite distinctive and indicate a diet quite different from that of *Gnathiphimedia*, for example.

The transverse upper lip connects this genus with *Maxilliphimedia*, but it is well separated by the other mouth-parts, though the stout maxillary palp shows a tendency to evolve in the direction of the latter genus.

The species described below is designated as the genotype.

Labriphimedia vespuccii, Brnrd. (Fig. 69).

Barnard, 1931, p. 427.

Occurrence: St. 51. Falklands. 1 ovig. ♀ 16 mm.

Description. Integument indurated, sparsely punctate. Rostrum stout, about as long as rest of head. Antero-lateral margin of head with two rather broad subquadrate teeth separated by a narrow notch; the lower tooth in the present specimen is somewhat bent inwards over the bases of the mandibles. Eyes rather larger than in most of the other allied species. Peraeon segment 7 with a pair of dorsal processes. Postero-inferior angles of segments 1–4 rounded, of 5–7 subacute. Side-plates 1–3 rounded below; 4 rather blunt below, postero-inferior angle quadrate, lower posterior margin not strongly concave. Pleon segments 1–3 each with paired dorsal processes, and a medio-dorsal low keel, as in *L. rigida*, but that on segment 3 ending posteriorly in a sharp tooth; postero-inferior angles of segments 2 and 3 with short points, the hind margin on segment 3 serrate between the lower angle and the short lateral point; segment 4 with a rather high medio-dorsal keel, deeply notched in middle and ending posteriorly in a short tooth; the dorso-lateral keels on segment 6 ending acutely. Telson apically notched, the lobes sharply pointed.

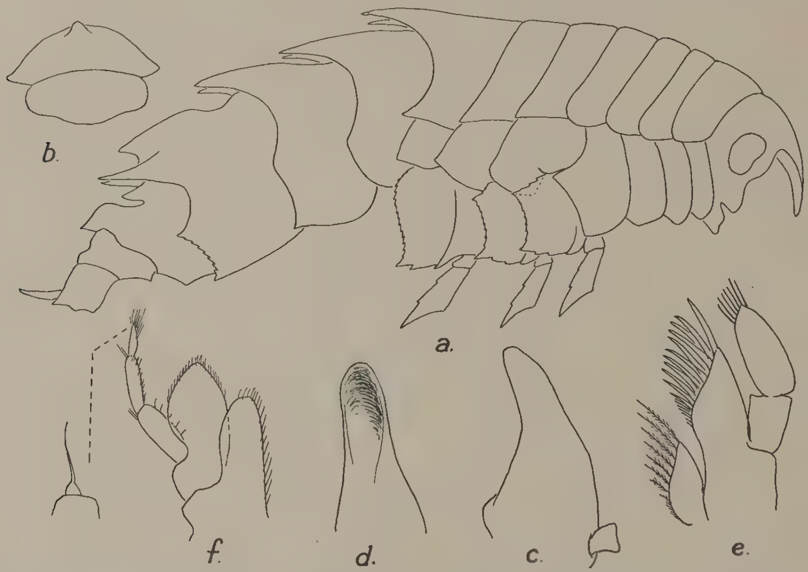

Fig. 69. *Labriphimedia vespuccii*, Brnrd. *a*. General view. *b*. Epistome and upper lip. *c*, *d*. Ventral and inner views respectively of mandible, 2nd and 3rd joints of palp omitted. *e*. Maxilla 1. *f*. Maxilliped, apex of 3rd palpal joint with rudimentary 4th joint further enlarged.

Antenna 1, inner distal margin of 1st joint with a short bidentate tooth not extending beyond end of 2nd joint, with a short tooth at its base on upper inner apex; one strong tubercle in middle of lower surface. Epistome transverse, with a median conical tubercle proximally. Upper lip transverse, twice as broad as long, distal margin not incised. Mandible tapering to a smooth, narrowly rounded, scoop-like or spoon-like apex, concave on inner surface, no secondary cutting-plate or spine-row, molar rudimentary. Lower lip without inner lobes, outer lobes not apically incised. Maxilla 1, outer lobe obliquely truncate, with about 11 serrate spines and some setae, palp stout, 1st joint a little longer than broad, 2nd ovate, extending beyond apex of outer lobe. Maxilliped, inner plate moderately broad, outer plate broad, apically somewhat pointed, palp slender, 2nd joint not apically enlarged or produced, 4th joint a mere rudiment with one long seta.

Peraeopods 3–5, 2nd joints strongly expanded, lower hind corners produced in short points, a shorter point at upper hind corner in peraeopods 3 and 4, lower and hind margins serrate.

Uropod 2, outer ramus two-thirds length of inner ramus.

REMARKS. Named after Amerigo Vespucci, the Florentine cosmographer, who was probably the first to sight the Falkland Islands (Boyson, *The Falkland Islands*, Oxford, 1924, p. 15).

Genus **Echiniphimedia**, Brnrd.

Barnard, 1930, p. 358.

Echiniphimedia hodgsoni (Wlkr.).

Walker, 1907, p. 30, pl. xi, fig. 8.
Barnard, 1930, p. 359, fig. 31.
Schellenberg, 1931, p. 123.

Occurrence: 1. St. 140. South Georgia. 1 juv. 10 mm.
2. St. 148. South Georgia. 1 ♀ 40 mm.
3. St. 149. South Georgia. 2 ♂♂ 11 and 20 mm., 1 ♀ 12 mm.
4. St. 158. South Georgia. 1 ♀ 18 mm.
5. St. 170. South Shetlands. 1 ♀ 24 mm.
6. St. 175. South Shetlands. 1 ♂ 13 mm.
7. St. 190. Palmer Archipelago (90–130 m.). 1 ♂ 25 mm.
8. St. MS 71. South Georgia. 1 ♀ 23 mm.

REMARKS. The ♀ from St. 170 and the ♂ from St. 175 are conspicuous amongst all the others by their distinctly longer and more slender spines, and thus are more like Walker's figure than the other Discovery or Terra Nova specimens. But the arrangement of the spines does not differ, and they can be regarded as casual variations. The supra-ocular spine is absent in all the specimens except the ♂ from St. 190.

The colour of the specimens from St. 149, 158 and 190 respectively is given as "pale pinkish buff with pink eyes", "creamy white with a close speckling of minute red spots all over body and legs, eyes reddish brown", and "pale buff with pink eyes, tips of mouth-parts dark yellow".

On two occasions, St. 149, 190, it was noted that this species was probably commensal with a sponge. The spiny armature may therefore be a case of mimicry, the length of the spines depending on the species of sponge.

DISTRIBUTION. Coulman Island, 100 fathoms; McMurdo Sound and off Oates Land, 329–547 m.

Echiniphimedia echinata (Wlkr.).

Walker, 1907, p. 28, pl. x, fig. 16.
Chevreux, 1913, p. 118.
Barnard, 1930, p. 361, fig. 23 (*nodosa*, *non* Dana).

Occurrence: 1. St. 140. South Georgia. 1 ♀ with embryos 26 mm.
2. St. 148. South Georgia. 1 ♀ 19 mm.
3. St. 149. South Georgia. 8 ♂♂ 13–17 mm., 5 ♀♀ 15–20 mm., 1 ♀ with embryos 27 mm., 1 juv. 8·5 mm.
4. St. 190. Palmer Archipelago (90–130 m.). 1 ♂ 16 mm., 1 ovig. ♀ 23 mm.

REMARKS. Compared with the Terra Nova specimens, the present lot are remarkably uniform in their armature. Peraeon segments 1–6 and side-plates 1–3 quite smooth. Lateral carina, formed by the overlapping lower margins of the segments, prominent and indicated even in the young taken from the brood-pouch. Denticles on 2nd joints of peraeopods 3–5 increasing in number with age from three to five or seven. The tufts of sensory filaments on antenna 1 are usually better developed and more prominent, in both sexes, than in Walker's figure.

As shown above I have now followed Stebbing in his interpretation of Dana's *nodosa*, and keep *echinata* as a separate species. The essence of the distinction between the two forms is the presence of *paired* dorsal processes in *nodosa*, and their absence in *echinata*; in the latter form consequently the medio-dorsal carination assumes a greater prominence. A profile drawing such as Dana's would apply to both forms; hence the impossibility of an absolutely certain determination of *nodosa* in the absence of Dana's type. Dana's figure shows denticles on the sides of the pleon segments as in *echinata*, but the 2nd joints of peraeopods 3–5 as in the form here called *nodosa*.

The colour of no. 3 is given as "pale yellowish buff with faint red speckling on spines of abdomen, on posterior coxal plates and on last three thoracic legs. Most of the specimens were found in a sponge".

DISTRIBUTION. McMurdo Sound; south of Graham Land.

Genus **Pariphimedia**, Chevr.

Chevreux, 1906, p. 38.
Stebbing, 1914, p. 358.

The original diagnosis of this genus has already been slightly modified by Stebbing. His explanation (1910, p. 584) of Chevreux's figure of the mandible is obviously correct, and is confirmed by the present specimens in which there is not a trace of a secondary cutting-plate in either mandible.

There is also a minute unguiform 4th joint in the palp of the maxilliped, situated on the outer margin and not extending to the apex of the 3rd joint.

The statement in the original diagnosis that "le telson est échancré" was apparently a misprint, but it is literally true; all the present specimens have the telson apically notched, and the same is true of *normani*.

A littoral and shallow-water genus.

Pariphimedia integricauda, Chevr. (Fig. 70).

Chevreux, 1906, p. 39, figs. 21–23.
Chilton, 1912, p. 487.

Occurrence: St. 179. Palmer Archipelago. 1 ♂ 11·5 mm., 2 ♀♀ 15 mm., 1 juv. 6·5 mm.

REMARKS. The lower margin of the rostrum is continued as a low median keel on to the base of the epistome, rising at its upper end into a triangular pointed tooth. The dorsal tooth on the 3rd pleon segment rises from a low keel. Side-plate 4 fits into a groove near the lower margin of side-plate 5, its acute postero-inferior angle projects somewhat laterally; side-plate 6 is also grooved near the lower margin for the reception of the base of the 4th peraeopod when this limb is pushed backwards. The telson is apically notched. Mandibles without a trace of a secondary cutting-plate. Palp of maxilliped with a minute unguiform rudiment of a 4th joint, not extending to the apex of the 3rd joint, and bearing a single long seta.

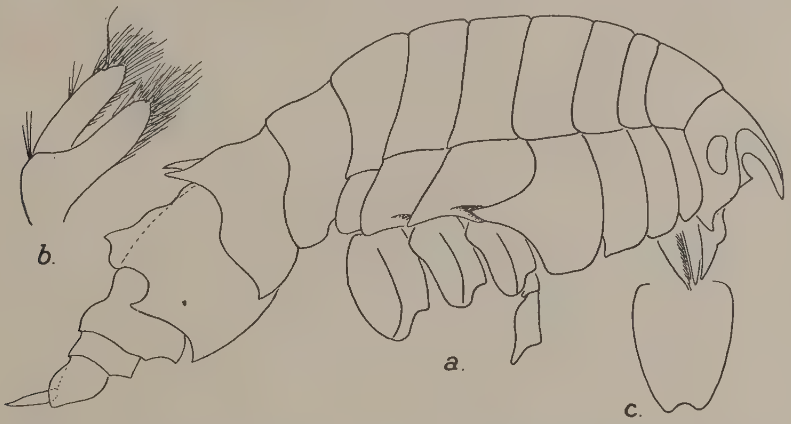

Fig. 70. *Pariphimedia integricauda*, Chevr. *a*. General view. *b*. 2nd, 3rd and rudimentary 4th joints of palp of maxilliped. *c*. Telson.

The colour as preserved is brownish-orange.

DISTRIBUTION. Palmer Archipelago, littoral; South Orkneys, littoral to 4 fathoms.

Pariphimedia normani (Cunn.) (Fig. 71).

Cunningham, 1871, p. 498, pl. lix, fig. 7.
Stebbing, 1906, p. 217; 1914, p. 359, pls. iv, v.
Schellenberg, 1931, p. 119.

Occurrence: St. 53. Falklands. 2 ♀♀ 9–10 mm. from kelp root.

REMARKS. Easily distinguished from the previous species by the absence of the paired processes on pleon segment 2 and the toothed keel on segment 3.

The median keel from the base of the rostrum to the epistome is the same as in *integricauda*. Side-

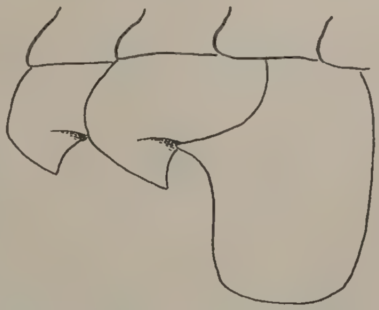

Fig. 71. *Pariphimedia normani* (Cunn.). Side-plates 4–6.

plates 5 and 6 are likewise grooved, but their shape is different, as is also that of side-plate 4. The antero-inferior angle of the head is acute. The rudimentary 4th palpal joint of the maxilliped is present, but very minute.

The colour of the smaller specimen is given as "deep bluish-violet mottled posteriorly with pale spots. Eyes pink. Antennae white; legs white except for basal segments [= joints]". As preserved the specimen is dull orange, eyes darker. The colour of the larger specimen presents a marked contrast, being "pure white with pink eyes". There are no structural differences. Cunningham gave the colour as purplish.

DISTRIBUTION. Elizabeth Island (in Magellan Strait); Falkland Islands.

Genus **Panoploea**, Thoms.

Stebbing, 1906, p. 211; 1910, p. 585.
Chevreux, 1913, p. 114.
Stephensen, 1927, p. 313.

Panoploea joubini, Chevr.

Chevreux, 1913, p. 114, figs. 19–21.

Occurrence: St. 195. South Shetlands. 1 ♀ 7 mm.

REMARKS. The lower margins of all the peraeon segments are imbricate, forming a lateral keel. No median keel or tooth between base of rostrum and epistome.

The colour is given as "brown and semitransparent. A large milk-white dorsal patch on thoracic segments 3–7, extending on to coxopodites. Abdominal segments 2 and 3 closely dotted with white dorsally and dorso-laterally. Eyes bright scarlet".

DISTRIBUTION. Off Adelaide Island, 250 m.

Panoploea macrocystidis, n.sp. (Fig. 72).

Occurrence: St. 53. Falklands. 1 ovig. ♀ 8 mm. from kelp root.

DESCRIPTION. Rostrum stout, slightly deflexed; a small sharp tooth at its base between bases of 1st antennae. Anterior margin of head slightly angular below eye; antero-inferior angle produced in an acute curved point. Peraeon segments 1–6 dorsally smooth, segment 7 with a pair of pointed processes; postero-inferior angles of segments 1–4 rounded, of segments 5–7 each produced in a pointed process; lower margins of all segments imbricate, forming a lateral keel. Side-plate 1 subtriangular, narrowed below, 2 and 3 oblong, 5–7 each with postero-inferior angle pointed; 5 with a groove, which however scarcely receives the posterior process of side-plate 4, but is for the purpose of allowing movement to the 2nd joint of peraeopod 3; 6 also has a short groove for the reception of the 2nd joint of peraeopod 4. Pleon segments 1 and 2 each with a pair of dorsal processes; segments 1–3 with a medio-dorsal keel which ends in a backwardly directed tooth; on segment 3 its profile is sinuous; segment 4 with a shallow transverse depression; 5 and 6 smooth, the dorso-lateral keels on the latter slight and ending bluntly. Postero-lateral margins of segments 1–3 with a tooth, that on segment 3 longest and upturned; postero-inferior angle of segment 1 rounded, of segments 2 and 3 produced in a short point. Telson apically notched, the lobes rather sharply pointed.

Antenna 1, 1st joint with two acute processes on inner apex; rest of antenna 1 and whole of antenna 2 lost. Mandible elongate, apically subacute, secondary cutting-plate in right mandible only, elongate, apically bifid, molar reduced to a small tubercle. Maxilla 1, palp 2-jointed, not extending to apex of outer lobe. Maxilliped, 2nd joint of palp produced along inner margin of 3rd.

Gnathopods 1 and 2 as figured for *I. pacifica*, Stebb. (1888, pl. lxxi).

Peraeopods 3–5, 2nd joint strongly expanded, the hind margin produced into three strong teeth. The lateral longitudinal keel also produces a small tooth where it joins the lower hind margin.

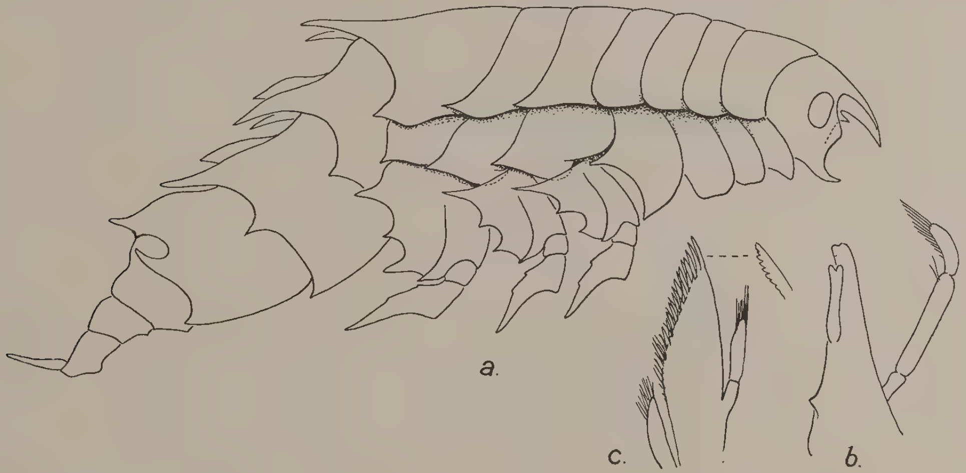

Fig. 72. *Panoploea macrocystidis*, n.sp. *a*. General view, showing only the near-side process of the pair of dorsal processes on pleon segment 2. *b*. Right mandible. *c*. Maxilla 1, with spine from outer lobe further enlarged.

Uropod 2, outer ramus three-quarters length of inner ramus. Uropod 3, rami ovate-lanceolate.

REMARKS. The superficial likeness in dorsal armature to *Iphimedia pacifica*, Stebb., and *pulchridentata*, Stebb., and to *Panoploea joubini*, Chevr., is great; but the species really resembles *P. eblanae* even more closely, though the absence of paired dorsal processes on pleon segment 3 and the extra tooth on the 2nd joints of peraeopods 3–5 distinguishes it from the latter. Compare also, *P. multidentata*, Schell. 1931, p. 117, fig. 63.

The specimen was found among kelp roots and its colour was "brown, closely covered with small crimson spots. Legs broadly banded with red. Eyes bright pink".

Panoploea excisa, n.sp. (Fig. 73).

Occurrence: St. MS 82. Saldanha Bay, South Africa. 1 ovig. ♀ 3·5 mm.

DESCRIPTION. Rostrum acute, not strongly bent downwards. Eyes circular, pale (as preserved). Peraeon segments all rounded dorsally, without teeth except segment 7 which has a pair of very minute and inconspicuous denticles. Side-plates 1–4 oblong, rounded below, only the postero-inferior angles of 1 and 2 quadrate; postero-inferior angle of 5 and 6 rounded, of 7 quadrate, but not produced. Pleon segments 1–3 each with two dorsal procumbent teeth, no medio-dorsal carinal teeth, postero-inferior angle of segment 2 with a small acute point, of three acutely produced, with two to three small serrations and one larger tooth subapically on lower margin. Telson oblong, apex truncate, slightly emarginate.

Antenna 1, 1st and 2nd joints produced in two short denticles on lower apices, flagellum 7-jointed. Maxilla 1, palp slender, not reaching apex of outer lobe. Maxilliped, 2nd palpal joint produced on inner apex.

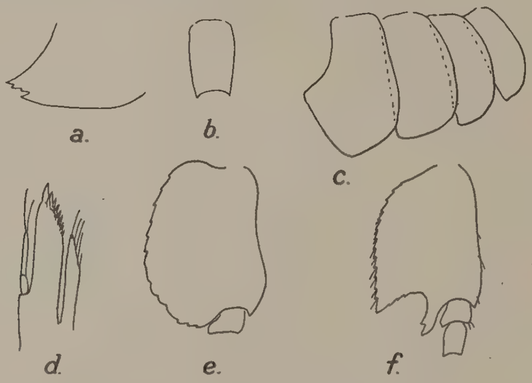

Fig. 73. *Panoploea excisa*, n.sp. *a*. Pleon segment 3. *b*. Telson. *c*. Side-plates 1–4. *d*. Maxilla 1. *e*. 2nd joint of peraeopod 3. *f*. 2nd joint of peraeopod 5.

Gnathopod 1 slender, chelate, 5th and 6th joints subequal, slightly longer than 3rd. Gnathopod 2 slender, subchelate, 5th and 6th joints subequal, 6th slightly widening distally to the rounded palm (as in figure of *Iphimedia capicola*, *supra*).

Peraeopods 3 and 4, 2nd joint with upper and lower hind angles rounded, hind margin feebly serrulate, with a slightly deeper indentation near lower angle, more pronounced in peraeopod 4 than in 3. Peraeopod 5, 2nd joint with a wide semicircular excision distally, hind margin serrate.

Uropods 1 and 2 unarmed, uropod 2 slightly shorter than 1. Uropod 3 as long as uropod 1, inner ramus longer than outer, ensiform, inner margin with a few widely-spaced minute short spinules.

Antenna 2 and distal joints of all peraeopods lost.

REMARKS. The excised 2nd joint of peraeopod 5, and the rounded apices of side-plates 1–4 are the distinguishing features of this species, which as regards the mouth-parts agrees with *minuta* (cf. Sars, 1895, pl. cxxxiii, fig. 1). This is the first record of this genus in South African waters.

Family PAGETINIDAE

Barnard, 1931, p. 427.

Rostrum absent. Eyes present. Body moderately compressed, dorsally rounded. Pleon segments 5 and 6 coalesced. Side-plates shallow. Telson short, entire. Antennae short, 1st without accessory flagellum. Mandible without molar. Lower lip without inner lobes, outer lobes widely separated, mandibular processes blunt. Maxilla 1, palp reduced, inner lobe ? absent. Maxilliped, outer plate short, inner plates obsolete. Gnathopods 1 and 2 subchelate. Peraeopods 1–5 alike, 3–5 not much longer than the others, 2nd joint in peraeopod 5 moderately expanded. Peduncles of pleopods moderately long. Uropods 1 and 2 biramous; uropod 3 uniramous. Branchial lamellae simple.

Remarks. The peculiar little Amphipod described below conflicts in one character or another with the definition of every family. The shallow side-plates, lower lip with its widely separated outer lobes and obsolete inner lobes, and the maxilliped recall certain Pardaliscids; the antennae, mandibles and the similarity to one another of the peraeopods recall *Lafystius*. The reduction of the maxillary palp and the uniramous character of uropod 3 are found in various families and are thus without significance. Fusion of the 5th and 6th pleon segments occurs in the Atylidae and certain Podocerids.

The name is taken from Mt Paget in South Georgia.

Genus **Pagetina**, Brnrd.

Barnard, 1931, p. 427.

With the above characters.

Pagetina genarum, Brnrd. (Fig. 74).

Barnard, 1931, p. 427.

Occurrence: 1. St. MS 22. South Georgia. 1 immat. ♀ 5·5 mm. *Type* ♀.
2. St. 42. South Georgia. 1 ♂ 5 mm. *Type* ♂.
3. St. 45. South Georgia. 1 ♂ 5 mm.

Description. Rostrum obsolete. Antero-lateral angle of head rounded, forming a deep cheek. Eyes lateral, small, circular. Back rounded, smooth. Side-plates shallow, 1 subtriangular, rounded in front, nearly straight behind, postero-inferior angle acute, 2 and 3 similar but longer, hind margins straight or feebly excavate, postero-inferior angles rounded-quadrate, 5 and 6 feebly bilobed, 7 shorter than any of the others, ovoid. Postero-inferior angle of pleon segment 2, quadrate, of 3 slightly produced in an acute point. Segments 5 and 6 fused. Telson oval, entire.

Antenna 1 short, 1st joint stout, flagellum 5-jointed, with sensory filaments, no accessory flagellum. Antenna 2 shorter than antenna 1, slender, flagellum 3-jointed.

Mandible, cutting-edge 4-dentate, secondary cutting-plate feeble, spine-row of three spines, no molar, palp well developed, 2nd and 3rd joints subequal. Lower lip without inner lobes, mandibular processes blunt. Maxilla 1, outer lobe ovate, tipped with about six spine-setae, inner lobe not observed, probably absent, palp short, 1-jointed, tipped with a single seta. Maxilla 2, outer and inner lobes subequal in size, the outer tipped with 2–3 setae, inner with 4. Maxilliped, inner plates apparently obsolete, outer plate very short, palp well developed, 4th joint unguiform.

Gnathopod 1, 2nd joint somewhat pyriform, 5th joint short, triangular, 6th widening to the slightly oblique palm which is defined by a rounded angle, finger matching palm. Gnathopod 2 similar but 2nd joint more linear and palm more oblique.

Peraeopods 1 and 2, 2nd joint moderately stout, 6th longer than 5th, dactyl about half length of 6th. Peraeopods 3 and 4, 2nd joint oblong, stouter in peraeopod 4 than in 3, 4th–6th joints somewhat more slender than in peraeopods 1 and 2. Peraeopod 5, 2nd joint pyriform, widest proximally, hind margin emarginate, postero-inferior angle rounded.

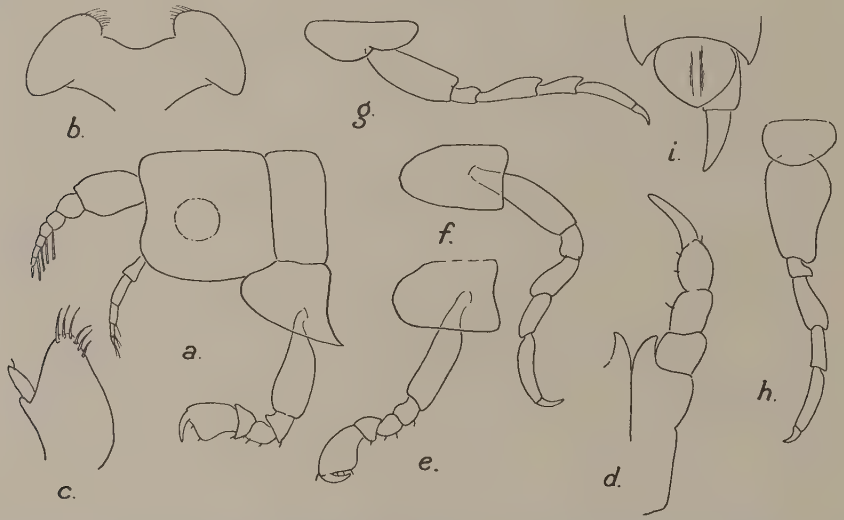

Fig. 74. *Pagetina genarum*, Brnrd. *a*. Head with antennae 1 and 2, side-plate 1 and gnathopod 1. *b*. Lower lip. *c*. Maxilla 1. *d*. Maxilliped. *e*. Gnathopod 2. *f*. Peraeopod 1. *g*. Peraeopod 3. *h*. Peraeopod 5. *i*. Telson and uropod 3.

None of the gnathopods or peraeopods are armed with more than a few isolated spinules.

Pleopods with moderately long peduncles.

Uropod 1 extending back about as far as uropods 2 and 3, outer ramus shorter than inner which is slightly shorter than peduncle, both rami terminating in a short stout spine, but otherwise unarmed. Uropod 2 similar to uropod 1. Uropod 3 uniramous, the ramus unguiform, slightly longer than peduncle, unarmed.

Branchial lamellae oval, simple. Brood-lamellae oval, but not fully developed.

REMARKS. Note 26 for St. 45 says: "Translucent and whitish. In middle of each of thoracic segments IV–VIII [*sic*, ? VII] and of abdominal segments I and II a large round scarlet dorsal spot. A thin longitudinal purple line on each side of the abdomen [*sic*, ? peraeon] beneath which on each segment are streaks of purple forming an irregular oval figure, the lower edge of which extends on to the coxal plates. First three abdominal segments each with a large oval spot of purple on each side and with reddish suffusion near the inferior edges. Eyes black. An ill-defined red patch at base of each thoracic limb and streaks of purple on second segment of last three thoracic limbs. Appendages otherwise colourless".

The specimens from St. 42 and 45 are now white, with black eyes, and purplish marks along the sides, a patch on each peraeon segment and on pleon segments 1–3, also on basal part of 2nd joints of peraeopods 3–5.

Family PARDALISCIDAE

Stebbing, 1906, p. 220.
Chevreux, 1911 (*Bull. Inst. océan. Monaco*, no. 204), p. 7.
Schellenberg, 1926, p. 334.

Genus **Pardalisca**, Kröy.

Stebbing, 1906, p. 221.
Schellenberg, 1931, p. 127.

Pardalisca abyssoides, n.sp.

Occurrence: St. 190. Palmer Archipelago (90–130 m.). 1 ♂ 23 mm.

Description. Very close to *abyssi* Boeck. Cutting edge of mandible not strongly dentate, the 4th (posterior) denticle remote from the other three. Apex of outer plate of maxilliped slightly oblique, the outer apical angle further forward than the inner. Distal margin of maxillary palp truncate (not rounded as in Stebbing's figure, 1888, pl. xciii), with not more than ten spines.

Gnathopod 2, 5th joint distinctly more expanded at base than in either Stebbing's (*loc. cit.*) or Sars' (1895, pl. cxliii, fig. 1) figures. The unguiform dactyl in both gnathopods almost as long as 6th joint.

Peraeopods 1 and 2, 4th and 5th joints more expanded, especially in peraeopod 1. Peraeopods 3–5, hind margin of 2nd joints straight, or slightly concave in peraeopods 4 and 5, noticeable proximal to the apical rounded lobe; 2nd joint in peraeopods 3 and 4 certainly narrower than in Sars' figure.

Eyes not visible, but probably represented by a small patch of white tissue beneath the cuticle.

Remarks. This constitutes the first record of *Pardalisca* in Antarctic waters, *P. marionis* being reckoned sub-Antarctic, and is further evidence of the similarity, and in some cases very close similarity, of the Arctic and Antarctic faunas.

Genus **Nicippe**, Bruz.

Stebbing, 1906, p. 225.
Barnard, 1916, p. 161.

Nicippe unidentata, n.sp.

Occurrence: 1. St. 181. Palmer Archipelago. 1 ♀ 14 mm.
2. St. 182. Palmer Archipelago. 1 ♂ 13 mm., 10 ♀♀ (1 ovig.) 10–12 mm. *Types.*

Description. Distinguished from *tumida* by the single tooth on pleon segment 4. The telson is scarcely more than twice as long as broad, the inner margins of the lobes straight, not sinuous. Secondary cutting plate in right mandible represented by a very stout spine (cf. Barnard, 1916). Second joint of peraeopod 5 with two (or three) long plumose setae arising from the submarginal keel on the inner surface. No trace of eyes or ocular pigment.

Remarks. A very close ally of *tumida*, which is a typical northern form, but has been recorded off the coasts of South Africa and California.

Genus **Synopioides**, Stebb.

Stebbing, 1906, p. 226.
Schellenberg, 1926, p. 336.

Synopioides macronyx, Stebb.

Stebbing, 1888, pp. 1000, 1223, pl. xciv *A*; 1906, p. 227.
Schellenberg, 1926, p. 336; 1926 *b*, p. 225, fig. 17.
Barnard, 1930, p. 363, fig. 34.

Occurrence: 1. St. 89. South Africa. 3 ♀♀ 9–11 mm.
2. St. 256. South-east Atlantic. 1 ♀ 9 mm.

Remarks. Head and other characters as described by Schellenberg (1926 *b*). Second joint of peraeopod 3 distally expanded on hind margin, of peraeopod 4 ovate, slightly concave proximally, of peraeopod 5 pyriform.

Distribution. Atlantic: 43° N–31° S. Southern Pacific and Indian Oceans.

Genus **Halice**, Boeck.

Stebbing, 1906, p. 228.
Chevreux, 1912 (*Bull. Inst. océan. Monaco*, no. 233), p. 1.
Barnard, 1925, p. 347.

Halice profundi, n.sp.

Occurrence: 1. St. 41. South Georgia. 1 ♂ 12 mm. *Type* ♂.
2. St. 45. South Georgia. 3 ♀♀ 8–10 mm. *Type* ♀.
3. St. 142. South Georgia. 1 ♂ 10 mm., 1 ovig. ♀ 11 mm.
4. St. 208. South Shetlands. 1 immat. ♀ 11 mm.
5. St. MS 71. South Georgia. 1 ♂ 8 mm.

Description. Very like *abyssi*, Boeck. Rostrum extending scarcely to midway along 1st joint of antenna 1. The short inferior margin of head projects considerably farther downwards in ♀ than in Sars' figure (1895, pl. cxlv) of *abyssi* and is rounded below. Side-plates 1–5 shallower than in *abyssi*. Postero-inferior angle of pleon segment 3 quadrate, with a minute point. Tooth on pleon segment 4 *double*, that on segment 5 slender, spine-like as in *aculeata*, Chevr., much longer than that on segment 4.

Antenna 1, accessory flagellum in ♂ ovate, about as broad as long, rather abruptly narrowed at the apex where the seta is inserted. The breadth may not be natural, but due to swelling in the preservative, though none of the other appendages show any undue swelling.

Gnathopod 2, 5th joint broader, more convex on lower margin than in Sars' figure of *abyssi*. Peraeopods 1 and 2 as in *abyssi*. Peraeopods 3–5 in ♂ more slender than in *abyssi*.

Telson and uropods as in *abyssi*.

The ♀ from St. 208 has the tooth on pleon segment 4 single.

REMARKS. The depth of the head in ♀, the double tooth on pleon segment 4 (normally), and the spiniform tooth on segment 5 are the distinguishing features of this Antarctic counterpart of the northern *abyssi*. The accessory flagellum in ♂, if natural, is a further mark of distinction.

Family OEDICEROTIDAE

Stebbing, 1906, pp. 235, 726.
Barnard, 1925, p. 348.
Schellenberg, 1925, p. 145; 1931, p. 139.

As the result of the Discovery Investigations this family, like several others, is shown to be well represented in the southern seas.

Genus **Paraperioculodes**, Brnrd.

Barnard, 1931, p. 427.

Rostrum short. Eyes completely fused, forming a circular (unpigmented) patch on top of head, not on rostral process, lenses well developed, numerous. First side-plate produced forwards. Telson short, broader than long.

Antenna 1 shorter than antenna 2. Mandible, molar with triturating surface, palp linear, 2nd joint not curved. Lower lip with inner lobes separate. Maxilla 1 with 1–2 setae on inner lobe.

Gnathopods 1 and 2, 5th joint with broad lobe, 6th joint ovate. Peraeopods 1 and 2 without expanded joints.

Uropod 3 not longer than uropods 1 and 2.

REMARKS. Resembling *Perioculodes* as regards the fused eyes and the short rostrum, but differing in the well-developed molar of the mandible, and the gnathopods. These same two characters also separate it from *Perioculopsis*, Schell.

Paraperioculodes brevimanus, Brnrd. (Fig. 75).

Barnard, 1931, p. 427.

Occurrence: 1. St. 144. South Georgia. 1 ovig. ♀ 5·5 mm.
2. St. 154. South Georgia. 7 ovig. ♀♀ 5–6 mm., 6 immat. 4–5 mm.
3. St. WS 62. South Georgia. 1 ovig. ♀ 4 mm.
4. St. MS 68. South Georgia (220–247 m.). 1 ♂ 6 mm., 3 ovig. ♀♀ 5·5 mm., 8 juv. and immat. 2·5–5 mm. *Types*.

DESCRIPTION. Integument smooth. Head, peraeon and pleon dorsally rounded. Rostrum short, only slightly deflexed. Eyes completely fused, forming a circular patch on top of head, not on rostrum, without pigment (as preserved), but with numerous highly refractive lenses. Postero-inferior angle of pleon segment 3 rounded. Telson short, broader than long, apically emarginate, a spinule on each rounded postero-lateral corner.

Antenna 1 shorter than antenna 2, the latter elongate in ♂. Upper lip ovate, longer than broad. Mandible, molar with well-developed triturating surface, palp linear, well developed, 2nd joint not strongly curved. Lower lip with inner lobes separate. Maxilla 1, inner lobe small, tipped with 1–2 setae.

Gnathopod 1 stronger than gnathopod 2, 5th joint with broad round lobe, 6th joint ovate, slightly longer than 5th, palm longer than hind margin. Gnathopod 2, 5th joint with fairly broad lobe, but not so broad as in gnathopod 1, 6th joint ovate, but narrower than in gnathopod 1.

Uropods with the rami subequal; the 3rd uropod not extending beyond the other two.

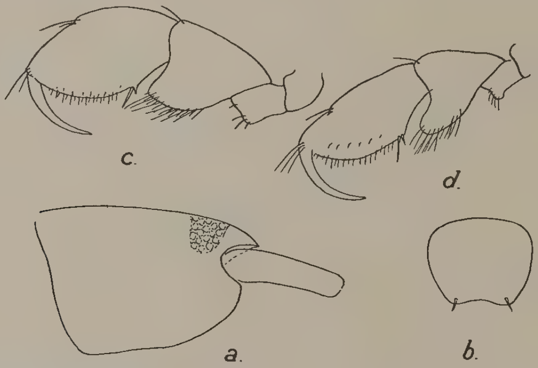

Fig. 75. *Paraperioculodes brevimanus*, Brnrd. *a*. Head with 1st peduncular joint of antenna 1. *b*. Telson. *c*. Gnathopod 1. *d*. Gnathopod 2.

REMARKS. The structure of the eyes invites comparison with *Oediceroides brevirostris*, Schell., 1931, p. 144, fig. 76.

Genus **Monoculodes**, Stmpsn.

Stebbing, 1906, pp. 258, 727.

Although typically the process of 5th joint of gnathopod 2 extends nearly or quite to the end of the hind margin of 6th joint, there are species (e.g. *latimanus*) in which it is shorter. All the species here described have a relatively short process.

Monoculodes antarcticus, n.sp. (Fig. 76).

? Strauss, 1909, p. 68, figs. 41–43. (*Bathymedon acutifrons*, *non* Bonnier.)

Occurrence: 1. St. 167. South Orkneys. 8 ♂♂ 16–20 mm., 11 ♀♀ 15–21 mm., 3 immat. 12 mm. *Types.*
2. St. 175. South Shetlands. 1 ♀ 17 mm.
3. St. 181. Palmer Archipelago. 9 ♀♀ (2 ovig.) 13–16 mm.
4. St. 182. Palmer Archipelago. 1 ♂ 15 mm., 2 ♀♀ 17–18 mm.
5. St. 187. Palmer Archipelago. 1 ♂ 14 mm., 1 ♀ 15 mm.

Description. Integument smooth, except when seen under a high magnification, when it has the appearance shown in the figure, viz. extremely minute denticles either singly or in groups. Back rounded, though peraeon segment 7 and the pleon are somewhat imbricate in profile. Rostrum moderate, reaching not quite to end of 1st joint of antenna 1, deflexed, evenly curved. Head not narrowly produced behind eyes. Eyes invisible, probably represented by a patch of white pigment on base of rostrum. Side-plates 1–4 rather deep, 1 subtriangular, expanded in front, as long as deep, 4 also as long as deep, posterior margin shallowly emarginate, postero-inferior margin oblique, straight. Postero-inferior angle of pleon segment 3 broadly rounded. Telson ovoid, longer than broad, distal margin slightly convex, with two spinules set in notches.

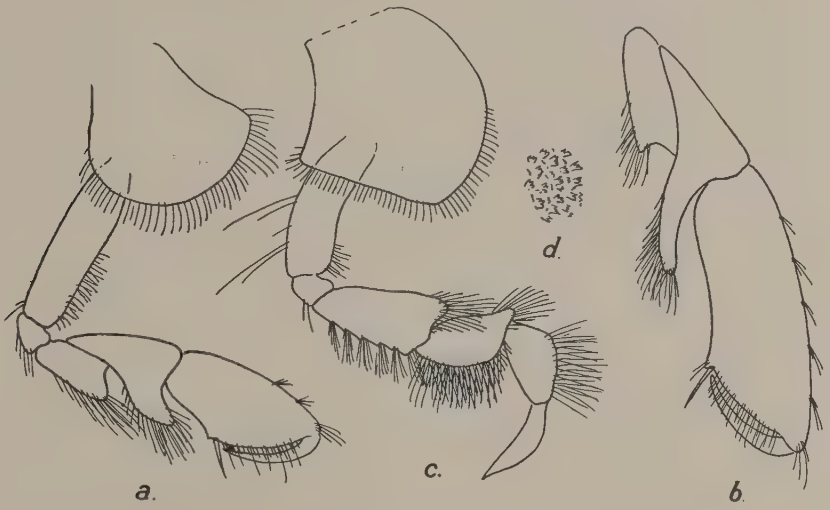

Fig. 76. *Monoculodes antarcticus*, n.sp. *a*. Gnathopod 1. *b*. Gnathopod 2. *c*. Peraeopod 2. *d*. Integumentary sculpture from dorsal part of pleon.

Antenna 1 reaching a short distance beyond peduncle of antenna 2, 1st and 2nd joints subequal, 3rd shorter, flagellum a little longer than peduncle, 20-jointed. Antenna 2, 4th joint slightly longer than 5th.

Gnathopod 1, 5th joint oblique, distally produced forwards, 6th oblong, longer than 5th, palm a little longer than hind margin, and defined by a long spine, with a small tooth below the spine. Gnathopod 2, the narrow process of 5th joint extending only half-way along lower margin of 6th joint, which is narrow oblong, palm defined by a long spine.

Peraeopods 1 and 2 stout, 4th–7th joints rather strongly expanded, 5th and 6th joints subequal, 7th a trifle longer than 6th, cultrate. Peraeopods 3 and 4, 2nd joint narrow pyriform, posterior margin distally straight or slightly concave, 4th expanded, much wider than 3rd or 5th, 6th longer than 5th, 7th longer than 6th, almost as long as 4th. Peraeopod 5, 2nd joint broadly pyriform, 4th not expanded, 4th and 5th subequal, 6th a little longer.

Remarks. Unlike the northern representatives of this genus, this species apparently has degenerate or very inconspicuous eyes, though the eyes in *pallidus*, Sars, are feebly developed, and in *tenuirostris* they are described as faint in alcoholic specimens. As further specific characters of this species may be noted the short process of 5th joint of gnathopod 2, and the strongly expanded joints of peraeopods 1 and 2.

It is more likely that the specimens recorded by Strauss (1909) as *Bathymedon acutifrons* are really this species than that they are referable to Bonnier's species.

Monoculodes scabriculosus, n.sp. (Fig. 77).

Occurrence: 1. St. 140. South Georgia. 4 ovig. ♀♀ 7–8 mm.
2. St. 164. South Orkneys. Many ♂♂, ovig. ♀♀ and juv. up to 10 mm. *Types.*
3. St. 173. South Shetlands. 6 ♀♀ (4 ovig.) 8–9 mm.
4. St. WS 62. South Georgia. 1 ovig. ♀ 6 mm., 2 ♀♀ 7 mm., 8 juv. 3–5 mm.
5. St. MS 65. South Georgia. 6 ovig. ♀♀ 9–10 mm., 1 ♀ with embryos 10 mm., 3 immat. ♀♀ 6–7 mm., 9 juv. 4–6 mm.
6. St. MS 67. South Georgia. 1 ovig. ♀ 10 mm., 3 ♀♀ 8–9 mm., 13 juv. 3·5–7 mm.
7. St. MS 71. South Georgia. 1 ovig. ♀ 10 mm.
8. St. MS 74. South Georgia. 5 ♀♀ 5–9 mm.

Description. Integument smooth anteriorly, but on the pleon segments minutely scabrous; the scabrosity formed by close-set triangular (pyramidal) tubercles, and extending about half-way down the pleura where it gradually disappears. Rostrum rather strongly deflexed, gibbous, but evenly curved. Head not narrowly produced behind eyes. Eyes well developed, dark. Side-plate 1 not strongly expanded in front, 4 slightly deeper than long, posterior margin excavate, lower margin evenly convex. Postero-inferior angle of pleon segment 3 broadly rounded. Telson ovoid, longer than broad, distal margin slightly convex, with two spinules set in notches.

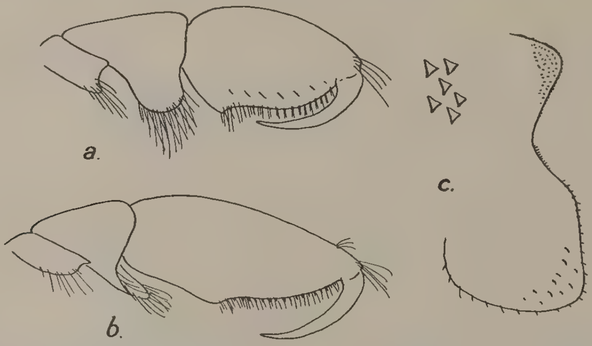

Fig. 77. *Monoculodes scabriculosus*, n.sp. *a*. Gnathopod 1. *b*. Gnathopod 2. *c*. Pleon segment 3, with integumentary sculpture further enlarged.

Antenna 1 reaching to about middle of 5th peduncular joint of antenna 2, 1st and 2nd joints subequal, 3rd shorter, flagellum 9–10-jointed. Antenna 2, 4th and 5th joints subequal, flagellum 16–17-jointed.

Gnathopod 1, 5th joint produced in a rounded lobe below, but not produced forwards, 6th longer than 5th, palm longer than hind margin, defined by a blunt tooth. Gnathopod 2, 5th joint with narrow spoon-shaped process extending only half-way along hind margin of 6th, 6th elongate-oval, palm longer than hind margin, defined by a slight emargination, but no tooth.

Peraeopods 1 and 2, joints moderately expanded. Peraeopods 3 and 4, 2nd joint oval, 4th expanded, 7th subequal to 6th. Peraeopod 5, 2nd joint broadly pyriform, 7th subequal to 6th.

Remarks. The very short process on the 5th joint of gnathopod 2 is distinctive, but whether the scabrosity on the pleon is unique one cannot say, because such features are frequently not recorded.

Monoculodes vallentini (Stebb.) (Fig. 78).

Stebbing, 1914, p. 360, pls. vi, vii.

Occurrence: St. 51. Falklands. 3 ♂♂ 10–11 mm., 2 ♀♀ 12–13 mm., 1 juv. 7 mm.

Description. Integument on the pleon covered with minute pointed denticles, much smaller than in *scabriculosus*. Rostrum moderate, reaching to middle of 1st joint of antenna 1, deflexed, evenly curved. Head not narrowly produced behind eyes. Eyes visible as oval white patches, contiguous on top of head. Side-plates 1–4 rather deep, 1 expanded in front, 4 with posterior margin emarginate, lower margin gently convex, i.e. not projecting very much lower than postero-inferior angle, the latter more narrowly rounded than in Stebbing's figure. Postero-inferior angle of pleon segment 3 broadly rounded. Telson quadrangular, slightly longer than broad, apex truncate, straight or very slightly emarginate, angles rounded, with a seta near each.

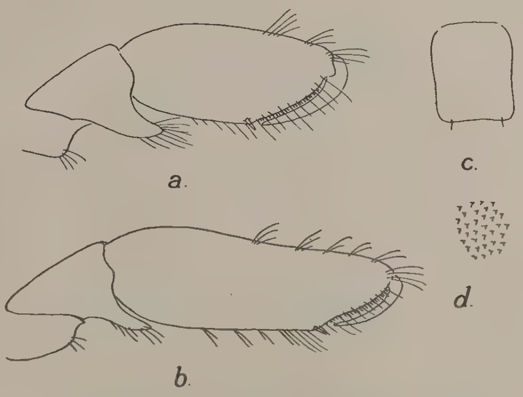

Fig. 78. *Monoculodes vallentini* (Stebb.). *a*. Gnathopod 1. *b*. Gnathopod 2. *c*. Telson. *d*. Integumentary sculpture from dorsum of pleon.

Antenna 1 reaching only a very short way beyond end of peduncle of antenna 2, 1st and 2nd joints subequal, 3rd much shorter, flagellum 15-jointed. Antenna 2, 5th joint a little, but distinctly, longer than 4th, flagellum mutilated.

Gnathopod 1, 5th joint with process not nearly as narrow as in Stebbing's figure, extending half-way along hind margin of 6th, 6th ovoid, palm subequal to hind margin, defined by a small spine. Gnathopod 2, 5th joint with process narrow, extending not more than one-third length of hind margin of 6th, 6th elongate-ovoid, somewhat tapering distally, palm much shorter than hind margin and defined by a small spine.

Peraeopods 1–5, cf. Stebbing's figures, 2nd joint of peraeopod 5 more broadly expanded, subcircular, hind margin entire as in the figure on plate 7, not serrate as the figure of the whole animal on plate 6 seems to suggest.

REMARKS. It is but reasonable to assume that these specimens are the same as Stebbing's species, although the 5th joint of gnathopod 1 and the antennae are not exactly as Stebbing described them. It would seem that the antennae vary somewhat in relative lengths, though Stebbing even toyed with the idea of a new genus because the antennae in *vallentini* differed in length from those of the typical species *Monoculopsis longicornis*. The present specimens in this respect agree with those of *Monoculodes*.

DISTRIBUTION. Falkland Islands, low water.

Genus **Oediceroides**, Stebb.

Stebbing, 1906, p. 267.
Chevreux, 1911, p. 403.
Schellenberg, 1926 *b*, p. 226; 1931, p. 139.
Barnard, 1930, p. 366.

Oediceroides calmani, Wlkr.

Walker, 1907, p. 22, pl. vi, fig. 12.
Strauss, 1909, p. 6, etc., pl. ii, figs. 6–8 (structure of eye).
Chevreux, 1911, p. 403, figs. 1, 2 (*lahillei*).
Barnard, 1930, p. 366.

Occurrence: 1. St. 45. South Georgia. 1 ♂ 17 mm.
2. St. 145. South Georgia. 2 ♀♀ 14·5 and 22 mm.
3. St. 159. South Georgia. 2 ♀♀ 18–19 mm.
4. St. 167. South Orkneys. 1 ♂, 1 ♀ 21 mm.
5. St. 180. Palmer Archipelago (160–330 m.). 5 ♀♀ 12–20 mm.
6. St. 181. Palmer Archipelago. 2 ♂♂ 16 and 18 mm., 8 ♀♀ (3 ovig.) 16–24 mm., 3 immat. 12–14 mm.
7. St. 182. Palmer Archipelago. 1 ♂ 17 mm., 1 ♀ 14 mm.
8. St. 190. Palmer Archipelago (315 m.). 2 ovig. ♀♀ 21 mm.
9. St. WS 25. South Georgia. 1 ♀ 16 mm.
10. St. WS 33. South Georgia. 1 ♀ 19 mm., 1 juv. 10 mm.
11. St. MS 66. South Georgia. 1 ♀ 19 mm.
12. St. MS 67. South Georgia. 1 ♂ 12 mm.
13. St. MS 71. South Georgia. 2 ♀♀ 11 and 13 mm., 2 juv. 7–8 mm.

REMARKS. The eyes are much more gibbous and prominent than in Chevreux's figure.

The two ♀♀ from St. 145 are pale biscuit-colour, with numerous reddish specks, visible chiefly on head, side-plates 1 and 2, and on the pleon. The colour of the ♂ from St. 45 is given as "all body segments closely covered with small maroon chromatophores, appendages pale, eye black".

It would seem that *lahillei* is synonymous, showing an extreme development of the dorsal "wrinkling", which is somewhat variable, as is seen in the present material, and as was remarked upon by Chevreux in 1913 in comparing his specimens of *calmani* with Walker's original description. See also Schellenberg, 1931, p. 140.

DISTRIBUTION. Ross Sea, 100 fathoms and 256–379 m.; Marguerite Bay, 200–254 m.; South Sandwich Group, 30–50 fathoms.

Oediceroides macrodactylus, Schell. (Fig. 79).

Schellenberg, 1931, p. 140, fig. 74.

Occurrence: 1. St. 42. South Georgia. 3 ♀♀ 9–11 mm.
2. St. 45. South Georgia. 1 ♂ 11 mm., 8 ♀♀ 10–15 mm.
3. St. 123. South Georgia. 30 ♀♀ 9–13 mm.
4. St. 144. South Georgia. 15 ♀♀ 8–12 mm.
5. St. 148. South Georgia. 4 ♀♀ 11–12 mm.
6. St. 149. South Georgia. 1 ♂ 10 mm., 3 ♀♀ 11–13 mm.
7. St. 195. South Shetlands. 4 ♂♂, 5 ♀♀ 8–10 mm.

DESCRIPTION. Integument minutely shagreened and pubescent. Head, peraeon and pleon dorsally rounded. Rostrum gibbous, deflexed, extending to end of 1st joint of antenna 1. Antero-lateral angle of head subacute (as in *Paroediceros lynceus*, Sars, 1895, pl. ciii). Eyes apparently well developed, with glistening lenses, but quite white. Side-plate 1 strongly expanded and produced forwards below, 4 moderately excavate on hind margin. Telson subquadrate, distally slightly emarginate.

Antenna 1, 2nd joint nearly as long as 1st.

Gnathopod 1, 5th joint broadly lobed below, posteriorly rounded, anterior angle subquadrate. Gnathopod 2, 5th joint produced downwards in the shape of an oblique oblong or plough-share, somewhat similar to that of *calmani* (see Chevreux, 1913, fig. 30 *A*), and quite unlike the rounded lobe in *rostratus* or *cinderella*.

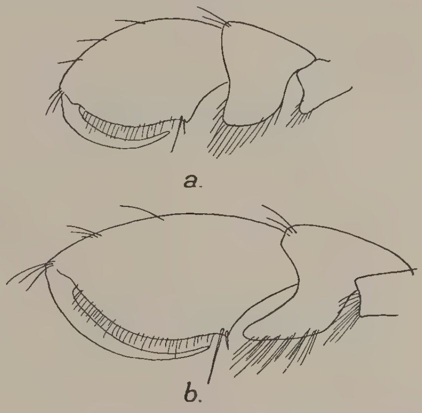

Fig. 79. *Oediceroides macrodactylus*, Schell. *a*. Gnathopod 1. *b*. Gnathopod 2.

REMARKS. The characteristic features of this species are the even dorsal profile, the shape of the 5th joints in gnathopods 1 and 2, and the lack of coloured eye-pigment. The rostrum is not more gibbous than in *newnesi* or *calmani*.

The colour of no. 2 is given as "anterior half of body orange-red, remainder and appendages pale yellow, eyes red".

Genus **Methalimedon**, Schell.

Schellenberg, 1931, p. 150.

Methalimedon nordenskjöldi, Schell. (Fig. 80).

Schellenberg, 1931, p. 150, fig. 79.

Occurrence: 1. St. 27. South Georgia. 1 ovig. ♀ 6 mm.
2. St. 140. South Georgia. 2 ♀♀ (1 ovig.) 6 mm.
3. St. WS 33. South Georgia. 4 ♀♀ 7 mm.

REMARKS. This form is very close to *Parhalimedon turqueti*, Chevr., 1906, with which I at first identified the above specimens. They agree, however, with Schellenberg's description.

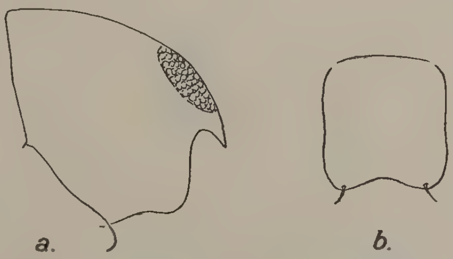

Fig. 80. *Methalimedon nordenskjöldi*, Schell. *a*. Head. *b*. Telson.

Family LILJEBORGIIDAE

Stebbing, 1906, p. 229.

Genus **Liljeborgia**, Bate.

Stebbing, 1906, p. 230; 1910, p. 588.
Schellenberg, 1925, p. 144; 1931, p. 128.

This genus is in an unsatisfactory state. I have not seen Walker's discussion of the variability of the dorsal denticles (*Tr. Liverp. Biol. Soc.*, XXIII, 102, 1907). The shape of the epistome may prove to be a useful specific character, but up to the present it has not been incorporated in descriptions, though it is more or less clearly indicated in the enlarged drawings of the head in Sars (1895). This defect should be remedied as soon as possible by some student having access to northern and Australasian material.

The South African specimen, identified by Stebbing as *dubia*, another resembling it in dorsal denticulation, and the specimen referred by me to *proxima* (1916, p. 167) are in too poor a condition to give any trustworthy evidence on this point.

It would seem also that the adult ♂ has features of considerable specific importance, namely, gnathopod 2 and peraeopod 5 (cf. Barnard, 1930, p. 365). Very few fully adult ♂♂ seem to have been noticed.

Liljeborgia kinahani (Bate) (Fig. 81).

Sars, 1895, p. 532, pl. clxxxviii, fig. 1.
Stebbing, 1906, p. 233.

var. capensis n.

Occurrence: St. 90. South Africa. 1 ♂ 10 mm., 1 ovig. ♀ 8 mm.

var. georgensis n.

Occurrence: St. 145. South Georgia. 1 ovig. ♀ 15 mm.

var. falklandica n.

Occurrence: St. 57. Falklands. 1 ♂ 11 mm.

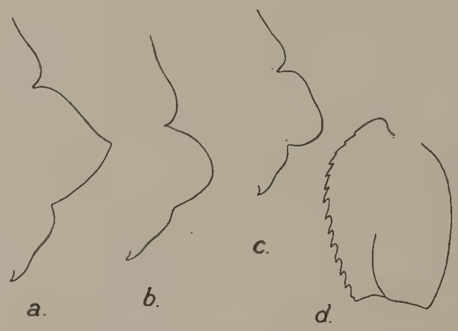

Fig. 81. *Liljeborgia kinahani* (Bate). Profile of epistome and upper lip of: *a.* Var. *capensis* n. *b.* Var. *georgensis* n. *c.* Var. *falklandica* n. *d.* 2nd joint of peraeopod 5 (♂) of var. *falklandica*.

REMARKS. These specimens all agree with Sars' figure and the descriptions of the northern *kinahani* as regards the tridentate pleon segments 1 and 2, and the single short decumbent tooth on both pleon segments 4 and 5. The fingers of gnathopods 1 and 2, however, have 7 and 17 serrations respectively; thus considerably more than in typical *kinahani*. The eyes are well developed, large (as in Chevreux's figure of *consanguinea*, 1913, fig. 25), black.

Epistome with the projecting keel triangular with an obtuse point in var. *capensis*, rounded subtriangular in var. *georgensis*, and oblong in var. *falklandica*.

Postero-inferior angles of side-plates 5 and 6 quadrate or slightly subacute, not toothed as in *mixta* Schell.

Hind margin of 2nd joint of peraeopod 5 with strong, deeply-indented serrations.

The difference between the three varieties lies in the epistome. It is admittedly very slight, but it exists, and on the material at hand from three different localities it is impossible to say whether it is a constant or variable feature. In the following species the epistome, while varying slightly as do all parts of an animal when several examples are studied, yet preserves its essential characteristic shape.

The institution of three varietal names will perhaps be excused for this reason.

All the specimens, especially those from the more southerly localities, are larger than typical *kinahani*.

If the dorsal denticles should prove to be variable it may be possible to include Chevreux's specimens under one or other of the above varieties, with which they conform in having large black eyes. For this latter reason I do not agree with Chevreux in assigning them to *consanguinea*, Stebb. Schellenberg has named these specimens *chevreuxi* (1931, p. 128), and has also described five more species (pp. 129–136), without, however, making reference to the epistome.

Liljeborgia longicornis (Schell.) (Fig. 82).

Schellenberg, 1931, p. 137, fig. 73.

Occurrence: 1. St. 27. South Georgia. 1 ovig. ♀ 10·5 mm.
2. St. 51. Falklands. 1 ♂ 18 mm., 3 ♀♀ 10, 11 and 17 mm., 1 juv. 5 mm.
3. St. 144. South Georgia. 2 ovig. ♀♀ 13·5 and 15 mm.
4. St. 159. South Georgia. 1 mutilated 15 mm.
5. St. 160. Shag Rocks. 1 ♂ 13 mm.
6. St. 170. South Shetlands. 1 ♀ 16 mm.
7. St. 195. South Shetlands. 1 ♂ 9 mm., 1 ♀ 12 mm.

DESCRIPTION. In general like *fissicornis* (M. Sars). Eyes absent. Epistome broadly rounded. Pleon segments 1 and 2 in most of the specimens with a single medio-dorsal tooth, which often has a minute denticle on each side near its base; in the largest ♂ and ♀ from St. 51 these two segments are both tridentate. Pleon segment 3 not dentate, the posterior margin dorso-laterally strongly convex, curving anteriorly to form a narrow V-shaped medio-dorsal excision, into which the tooth on segment 4 fits. Segments 4 and 5 each with a strong medio-dorsal carinal tooth, that on segment 4 the larger, the keel arising right from base of segment.

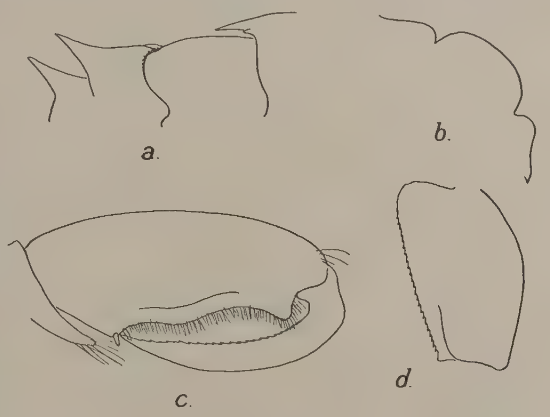

Fig. 82. *Liljeborgia longicornis*, Schell. *a*. Pleon segments 2–5. *b*. Profile of epistome and upper lip. *c*. Gnathopod 2 ♂. *d*. 2nd joint of peraeopod 5 ♂.

Gnathopods 1 and 2 in ♀ and immature examples normal, the number of serrations on the fingers increasing apparently with age from 3 to 5 in gnathopod 1, and from 8 to 12 or more in gnathopod 2. Gnathopod 2 in adult ♂ with elongate-ovate hand, palm three-quarters length of whole joint, sinuous, ending in a narrowly rounded lobe near hinge, a group of four spines surrounding a shallow excavation into which the tip of finger fits, finger serrate for nearly its entire margin.

Peraeopods 3–5, 2nd joints all broader than in *fissicornis*, the postero-inferior angle quadrate; dactyls short as in *fissicornis*.

Remarks. Although closely allied to *fissicornis*, the differences are well marked. The 3rd pleon segment not merely lacks the tooth found in *fissicornis*, but is dorsally incised for the reception of the keel on segment 4. This is an important specific character, and not to be regarded as in the same category as the number of dorsal denticles, which may be only varietal.

It is possible that the mutilated specimen from the South Orkneys, ascribed by Chilton (1912, p. 485) to *dubia*, belongs to the above described species.

Liljeborgia epistomata, n.sp. (Fig. 83).

Occurrence: Hoetjes Bay, Saldanha Bay, South Africa. 5. x. 26. 4 ♀♀ 11–15 mm. from stomach of *Trigla capensis*.

Description. Eyes apparently absent. Rostrum short, extending about one-third length of 1st joint of antenna 1. Antero-lateral angle of head rounded. Side-plate 1 distally expanded, lower margin of 1 and 2 setose, no denticle on postero-inferior corner of side-plates 1–3. Pleon segments 2, 4 and 5 each with a medio-dorsal tooth, those on segments 4 and 5 being the termination of medio-dorsal keels, that on 4 larger than that on 5, arising from base of segment and fitting into a narrow dorsal excision in the margin of segment 3, as in *longicornis* (*supra*). Postero-inferior angle of pleon segment 3 acutely produced, with a sinus above the point. Telson cleft to base, lobes oblong, apically truncate, with a prominent tooth on inner apex, the distal margin with three to four little denticles with long spine-setae arising between them.

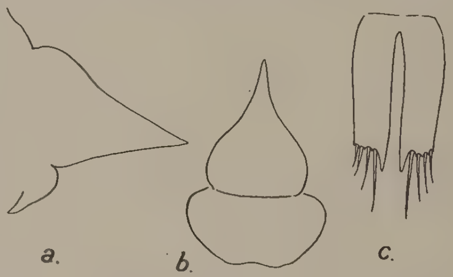

Fig. 83. *Liljeborgia epistomata*, n.sp. *a*, *b*. Profile and frontal view of epistome and upper lip. *c*. Telson.

Antenna 1 extending to middle of last peduncular joint of antenna 2, flagellum 16–20-jointed, accessory flagellum 7–8-jointed. Antenna 2, flagellum 18–22-jointed.

Epistome projecting as a prominent compressed acute tooth. Upper lip scarcely emarginate on distal margin. Mouth-parts normal.

Gnathopod 1, 6th joint ovate, finger with four teeth proximally on inner margin. Gnathopod 2 similar but larger, finger with eight teeth.

Peraeopods 1 and 2 slender, finger two-thirds length of 6th joint. Peraeopods 3–5, 2nd joints with hind margin almost straight, lower hind angle rounded-quadrate, margin serrate, finger one-third length of the setose 6th joint.

Uropod 3 with rami lanceolate.

REMARKS. The absence of a dorsal tooth on pleon segment 1, the truncate telsonic apices, and the projecting epistome are the distinctive marks of this species.

Family ARGISSIDAE

Walker, 1904, pp. 246, 248.
Stebbing, 1906, p. 722.

Walker instituted this family to include *Platyischnopus* alongside of *Argissa* on the grounds of the similar development of the 1st antenna of ♂, and the posterior peraeopods. To this opinion I cannot subscribe. The posterior peraeopods of *Platyischnopus* appear to me to be far more in conformity with those of the Haustoriidae, in which family Stebbing placed his genus (1906, p. 122). Secondly, the 1st antenna of ♂ of *Argissa* bears far more resemblance to that of e.g. *Pardalisca* than it does to that of *Platyischnopus*. I therefore suggest that *Platyischnopus* be left in the Haustoriidae. The following genus which agrees with *Argissa* in a number of characters may be included in the Argissidae, or alternatively both may find a place in the Tironidae where Stebbing placed *Argissa*.

Phylluropus, n.g.

Body compressed. Rostrum small. Eyes well developed. Side-plates 1–4 deep, but 3 much smaller than the others, 4 largest, feebly excavate on hind margin, 5–7 longer than deep, 5 feebly bilobed. Telson ?.

Antenna 1 with accessory flagellum. Upper lip feebly incised. Lower lip with inner lobes distinct. Mandible normal, palp strong. Maxilla 1 with few setae on inner lobe, palp well developed. Maxilla 2, inner lobe slightly broader than outer, with an oblique row of setae. Maxilliped normal.

Gnathopods 1 and 2 simple. Peraeopods 1 and 2, 2nd joint slender and elongate, 4th elongate. Peraeopods 3–5, 2nd joint expanded on both anterior and posterior margins, 4th long, 5th and 6th (at least in peraeopod 3) slender.

Uropods 1 and 2 with slender rami. Uropod 3 enormously developed, the rami lamellate, set in a vertical plane.

REMARKS. The remarkable Amphipod for which this genus is created is unfortunately represented by a single ♀, with a mutilated telson. The 3rd uropod of the right side is also abnormal, but in other respects the specimen is in good condition, though the 2nd antennae and the distal joints of peraeopods 4 and 5 have been lost after capture.

The deep anterior side-plates, the 3rd smaller than the 4th, give an appearance very like *Argissa*, though on close examination the 2nd side-plate is seen to be a little larger than the 1st, instead of obviously smaller. The gnathopods are comparable with those of *Argissa*, but peraeopods 1 and 2 have the 2nd and 4th joints distinctive. The 2nd joints of peraeopods 3–5 are certainly more akin to those of the Haustoriidae or some Tironidae than to those of *Argissa*. The mouth-parts afford no decisive argument as to the systematic position of this form.

The most remarkable feature is the 3rd uropod, which gives the hind end of the animal the appearance of, e.g., a Pronoid Amphipod or even a Cirolanid Isopod. Though the foliaceous rami appear to be set in a vertical plane, it may be assumed that in life they are capable of considerable lateral movement, and even in the preserved state the inner ramus can be pushed down so as to fit into the infolded outer margin of the outer ramus.

The discovery of the ♂ will be awaited with great interest. During the winter cruise of the 'Discovery II' in South Africa in 1930 Dr Kemp instituted a special search for this interesting little Amphipod, but without any success.

Phylluropus capensis, n.sp. (Figs. 84, 85).

Occurrence: St. 91. South Africa. 1 ovig. ♀ 5·5 mm.

DESCRIPTION. Integument smooth. Head with short, scarcely deflexed rostrum and acute antero-lateral angles. Eyes well developed, reniform, lateral, near the anterior margin, pale (as preserved). Side-plates 1–4 deeper than long, serrulate and setose on their lower margins, 3 much smaller than 2 or 4, the latter larger than either 1 or 2, ovate, shallowly excavate on hind margin proximally; side-plates 5–7 longer than deep, 5 feebly bilobed, the lobes subequal, 6 with slightly concave lower margin. Pleon segments 4 and 5 slightly gibbous posteriorly, but not dentiferous, the posterior margin minutely denticulate. Postero-inferior angles of pleon segments 1–3 rounded, the angle in segments 2 and 3 feebly crenulate. Telson as here figured, in course of regeneration.

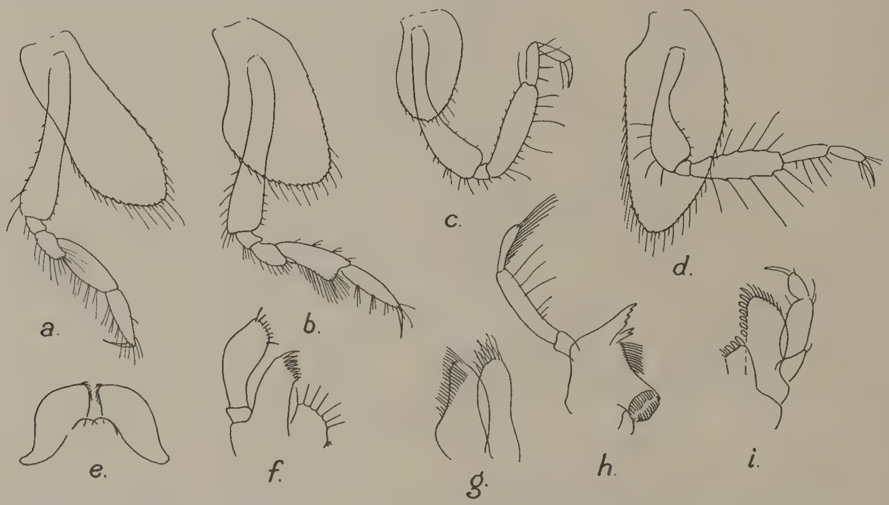

Fig. 84. *Phylluropus capensis*, n.g., n.sp. *a.* Gnathopod 1. *b.* Gnathopod 2. *c.* Peraeopod 1. *d.* Peraeopod 2. *e.* Lower lip. *f.* Maxilla 1. *g.* Maxilla 2. *h.* Mandible. *i.* Maxilliped.

Antenna 1 slender, 2nd joint longer and more slender than 1st, 3rd shorter than 1st, flagellum longer than peduncle, 11-jointed, accessory flagellum subequal to 1st flagellar joint, 2-jointed. Antenna 2 lost. Upper lip apically incised, slightly asymmetrical. Lower lip, inner lobes distinct, mandibular processes short, blunt. Mandible, cutting edge dentate (about 7), secondary cutting plate in both mandibles bidentate, spine-row and molar well developed, palp strong, the 2nd joint itself almost as long as trunk of mandible, 3rd shorter, setose. Maxilla 1, inner lobe with about eight spaced setae, outer lobe with about 11 spines, palp well developed, extending beyond apex of outer lobe, with about seven apical spinules and a few setules. Maxilla 2, inner lobe a little broader than outer, with apical setae, and an oblique row of setae extending on to inner margin proximally. Maxilliped, inner plate with three stout apical spines, outer plate with eight stout, clavate spines on inner margin, the distal ones becoming more elongate and transforming gradually into the spine-setae on distal margin, palp 4-jointed.

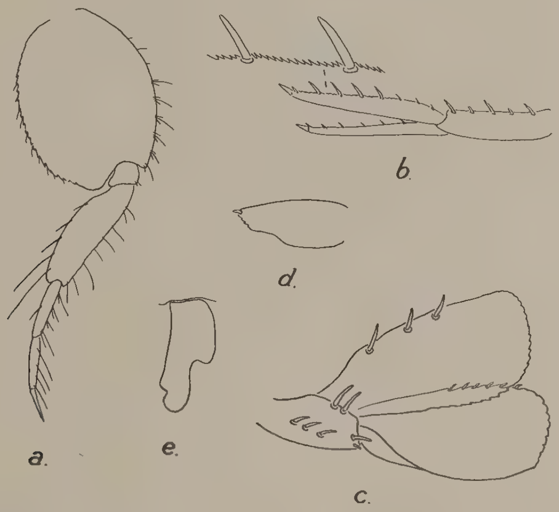

Fig. 85. *Phylluropus capensis*, n.g., n.sp. *a*. Peraeopod 3. *b*. Uropod 1, with upper margin of inner ramus further enlarged. *c*. Uropod 3 of left side. *d*. Mutilated uropod 3 of right side. *e*. Mutilated telson attached to pleon segment 6.

Gnathopod 1 simple, 2nd joint elongate, slender, 5th fusiform, 6th similar but shorter, 4th–6th, especially 5th, with long setae, dactyl slender, half length of 6th. Gnathopod 2 simple, 2nd joint elongate, slender, 5th narrow triangular, expanding to the distal truncate margin, 6th abruptly narrower and a little shorter than 5th, 4th–6th especially 5th with long setae, dactyl half length of 6th.

Peraeopods 1 and 2, 2nd joint elongate, slender, longer in peraeopod 1 than in peraeopod 2 (absolutely, as well as relatively to the side-plate), narrowest in the middle, thence tapering distally, the anterior margin consequently strongly sinuous, 4th fusiform, considerably shorter than 2nd in peraeopod 1, a little shorter than 2nd in peraeopod 2, with long outstanding setae, especially in peraeopod 2, 5th and 6th joints much more slender, 6th shorter than 5th, dactyls slender, a little shorter than 6th. Peraeopod 3, 2nd joint ovately expanded, anterior margin with spines and spinules, hind margin feebly serrate, postero-inferior lobe short, rounded, 4th joint long, cylindrical, slightly curved, 5th much narrower, 6th subequal to 5th but narrower, dactyl slender, half length of 6th. Peraeopods 4 and 5, 2nd joint similar to that of peraeopod 3 but anterior margin more convex and spinulose, and hind margin less convex, nearly straight in peraeopod 5, with larger postero-inferior lobe, 4th similar but longer, other joints lost.

Uropod 1, outer ramus subequal to peduncle, inner a little longer, both rami slender, spinose, the inner slightly wider than outer, its upper margin minutely serrutale. Uropod 2 not extending quite as far back as uropod 1, similar, but rami longer than peduncle. Uropod 3, peduncle comparatively short and stout with two spines on upper apex, a large and a small spine on lower apex, and three spines in middle of outer surface, rami enormously expanded into two lamellae extending much beyond the other uropods, set in a vertical plane, both obovate, with the distal margin crenulate, upper margin of outer ramus with five spinules, that of inner ramus with three spines. This description applies to the left uropod only; the right appears to have been injured like the telson, and is composed only of a laminate, vertically set, plate, ovate, apically feebly serrulate and with a spinule, apparently representing the peduncle.

Branchial lamellae large, simple. Oostegites narrow.

Remarks. As just stated the right uropod 3, as well as the telson, appear to have suffered injury during the life of the animal, and to be in process of regeneration. It is quite impossible to say what the normal shape of the telson is. Such as it is, it is here figured; it was articulated in the centre of the distal margin of the 5th segment.

Family TIRONIDAE

Stebbing, 1906, p. 273.
Chevreux, 1913, p. 133.
Barnard, 1925, p. 353.

To this family is to be added a new genus created for the reception of a very curious pelagic Amphipod taken off the coast of Portuguese West Africa.

Genus Tiron, Liljeb.

Stebbing, 1906, pp. 275, 727; 1908 (*Ann. S. Afr. Mus.*, vi), p. 79.
Walker, 1904, p. 263.

Tiron antarcticus, n.sp. (Fig. 86).

Occurrence: 1. St. 175. South Shetlands. 1 immat. ♀ 6·5 mm.
2. St. WS 33. South Georgia. 1 ♀ 7·5 mm. *Type*.

Description. Integument very minutely scabrous with little scale-like setules, best seen on the dorsal profile under a high magnification. Head carinate. Upper eyes faintly traceable, closely adjacent to top of head, lower eyes not traceable. Anterior peraeon segments feebly carinate; segments 6 and 7 distinctly carinate. Hind margin of posterior lobes of side-plates 5 and 6 crenulate, each notch with a setule. Pleon segments 1–5 carinate, the

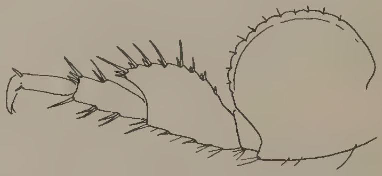

Fig. 86. *Tiron antarcticus*, n.sp. Peraeopod 5.

carina produced posteriorly into a tooth, which increases in size posteriorly, that on segment 5 being the largest; segment 6 feebly carinate, ending in a very small median tooth at base of telson. Postero-inferior angle of pleon segment 3 quadrate, with a very slightly produced point; a few widely-spaced setules on hind margin above the angle. Telson with a minute setule in a notch on apex of each lobe, and four to five setules on upper surface.

Antenna 1, flagellum 10-jointed, accessory flagellum 4-jointed. Antenna 2, flagellum 10–11-jointed. Maxillary palp not much widened. Maxilliped, outer plate with margin convex.

Gnathopods 1 and 2 and peraeopods 1 and 2 as in *acanthurus*. Peraeopods 3 and 4, 2nd joint obovate, wider distally, hind margin with a few crenulations, each notch with a setule. Peraeopod 5, 2nd joint broadly expanded, subcircular, hind margin crenulate, 4th joint strongly expanded on hind margin.

REMARKS. A species resembling *thompsoni* in the unidentate pleon segments, *acanthurus* in the telson and general features, but distinguished from all the three species of the genus by the 5th peraeopod.

Genus **Syrrhoë**, Goes.

Stebbing, 1906, p. 281.
Sexton, 1911, p. 202.
Monod, 1926, p. 54.

Syrrhoë psychrophila, Monod (Fig. 87).

Monod, 1926, p. 54, fig. 52 (*crenulata*, var.).
Schellenberg, 1931, p. 159, fig. 83.

Occurrence: 1. St. 45. South Georgia. 2 ♀♀ 12 mm.
2. St. 140. South Georgia. 2 ♂♂ 9 mm., 2 ♀♀ 8–9 mm.
3. St. 144. South Georgia. 1 ♂ 10 mm., 5 ♀♀ 8–10 mm.
4. St. 156. South Georgia. 1 ♀ 10 mm., 1 juv. 7 mm.

REMARKS. Monod distinguishes the Antarctic variety mainly by the gap in the denticulation on the posterior margin of pleon segment 3; the other two characteristics seem likely to be inconstant.

The present specimens have no denticulation on peraeon segment 7 or on pleon segment 4. The denticulation on pleon segment 3 is interrupted laterally. Typical *crenulata* has the 7th peraeon segment denticulate on the posterior margin. Presumably *psychrophila* resembled *crenulata* in this respect. Moreover, since Monod does not mention it among the differences separating the northern and southern forms, the hind margin of the 2nd joints of peraeopods 3–5 was presumably serrate as in Sars' figure (1895, pl. cxxxvi) of *crenulata*. In the present specimens these serrations are much smaller and more widely spaced, thus approaching *semiserrata*.

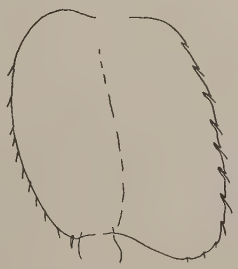

Fig. 87. *Syrrhoë psychrophila*, Monod. Second joint of peraeopod 5.

Side-plate 2 narrowing below to a rounded apex, not truncate as in *crenulata* and *semiserrata*. Antenna 1 with uncinate tooth on inner apex of 1st joint. Gnathopod 1 with 6th joint slightly widening distally.

I think it more than likely that these specimens are specifically the same as the Belgica specimens, but if so I consider that they deserve specific rather than varietal rank.

DISTRIBUTION. 70° 48′ S, 91° 51′ W and 71° 19′ S, 87° 37′ W, 400 m.

Syrrhoë nodulosa, n.sp. (Fig. 88).

Occurrence: 1. St. 170. South Shetlands. 5 ♀♀ (2 ovig.) 13–14 mm.
2. St. 181. Palmer Archipelago. 1 ♂ 14 mm., 1 ♀ 11 mm., 1 ovig. ♀ 14 mm. *Types*.
3. St. 182. Palmer Archipelago. 1 ♀ 12 mm.
4. St. 195. South Shetlands. 3 ♀♀ (2 ovig.) 11–13 mm.

DESCRIPTION. Integument not indurated, but firm, minutely shagreened. Head vaulted, rostrum reaching to just beyond middle of 1st antennal joint. Eyes prominent, ovoid, dorsally not quite contiguous. Peraeon segments 1 and 2 very short dorsally, together equal to 3rd segment, following segments increasing in length. Back rounded. Posterior margins of segments 4–7 more or less raised, prominent and, on segments 6 and 7, produced in a short medio-dorsal tooth, that on segment 7 with a tubercle in front of it. Segments 6 and 7 each with a blunt but well-marked horizontal keel just above junctions of side-plates; a similar keel or swelling also on segments 4 and 5 in some specimens. Side-plates as in *crenulata*. Pleon segments 1–3 each with a medio-dorsal blunt tubercle, followed by a projecting tooth on the hind margin, which seen in dorsal view is notched; whole posterior margin denticulate; a blunt horizontal keel on each segment continuing the line of those on peraeon segments 6 and 7; postero-inferior angle of segment 3 quadrate. Pleon segments 4–6 dorsally rounded, posterior margin of 4 denticulate. Telson elongate, cleft almost to base, lobes contiguous, tapering to acute, minutely notched apices.

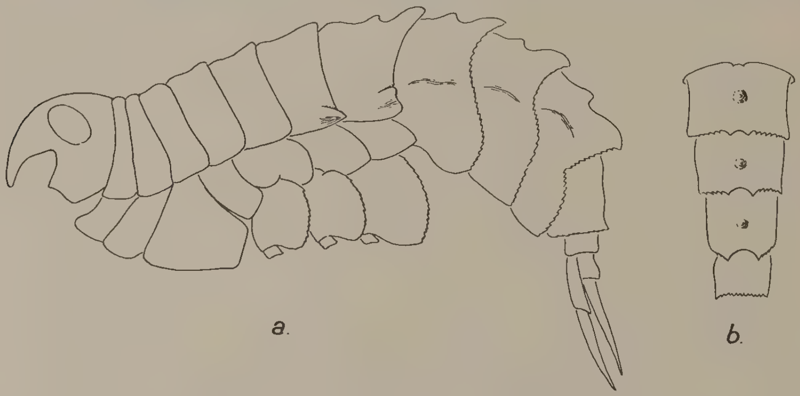

Fig. 88. *Syrrhoë nodulosa*, n.sp. *a*. General view. *b*. Dorsal view of pleon segments 1–4.

Antenna 1, 1st and 2nd joints subequal, upper margin of 1st sharply keeled, setose, distal margin on inside with upcurved tooth, 2nd more slender, 3rd just over half length of 2nd, flagellum 18–19-jointed, 1st joint long, accessory flagellum apparently 1-jointed, equal to first two flagellar joints. Antenna 2 a little longer than antenna 1, 5th joint shorter than 4th, both setose, especially dorsally, flagellum 13–14-jointed. Mouth-parts as in *crenulata*.

Gnathopods 1 and 2 as in *crenulata*, but 5th and 6th joints, especially in gnathopod 2, not so slender, strongly setose, with the same large serrate spine at angle of palms.

Peraeopods as in *crenulata*; 4th joints in peraeopods 3–5, and to a lesser extent, the 5th and 6th also, rather stouter than in Sars' figure (1895, pl. cxxxvi), and considerably stouter than in *semiserrata* (Stebbing, 1888, pl. li).

Uropod 1 extending not quite as far as the apices of telson, uropod 2 extending as far as, and uropod 3 only a very little beyond.

The colour of no. 1 (as preserved) is greyish, with numerous darker specks extending also over the 2nd joints of peraeopods 3–5, eyes bright salmon or orange; other specimens are dull yellowish with dark red specks, eyes yellowish. The colour in life is given in Note 142 for no. 2 as "ground colour creamy white, thorax and abdomen closely covered with small maroon spots, posterior legs broadly banded with red, eyes salmon-pink".

Genus Syrrhoites, Sars.

Stebbing, 1906, p. 279.
Barnard, 1925, p. 353; 1930, p. 367.

Syrrhoites anaticauda, Brnrd. (Fig. 89).

Barnard, 1930, p. 367, fig. 37.

Occurrence: 1. St. 170. South Shetlands. 5 ♂♂ 12–13 mm., 9 ♀♀ (4 ovig.) 11–13 mm.
2. St. 175. South Shetlands. 2 ♂♂ 12–13 mm., 1 ovig. ♀ 11·5 mm.

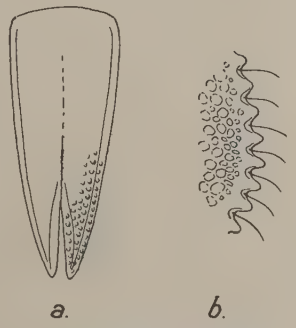

Fig. 89. *Syrrhoites anaticauda*, Brnrd. *a*. Ventral view of telson, showing bevelling of the edges, and pitted sculpturing. *b*. Portion of margin of 2nd joint of peraeopod 5 showing sculpture and simple marginal teeth.

REMARKS. These specimens show some slight differences from the original Terra Nova specimen.

More robust. Integument indurated and covered with numerous rather large and deep pits which extend also on to the telson and the 2nd joints of peraeopods 3–5. Dorsal carination usually less pronounced than in the original specimen, even in ♂, the peculiar reflexed hook on pleon segment 3 being reduced to an almost obsolete point; the keel on pleon segment 4 is more rounded, not as high even in ♂, and in ♀ much lower; the teeth on pleon segments 5 and 6 are well marked in ♂, that on 6 being larger than that on 5, but in ♀ almost obsolete.

On the other hand, the low rounded ridges flanking the dorsal carina are here more prominently nodose, both on the peraeon and pleon; and all the peraeon segments just above the junctions with the side-plates are nodose, as well as side-plates 5–7. Side-plate 4 often not so sharply acute below. Telson cleft for a little more than one-third of its length, apices acute, not notched; it is thick, and around the lateral margin and on either side of the cleft is bevelled on the under surface.

Antenna 1 as in *serrata* Sars, 1st joint scarcely enlarged basally, flagellum in ♂ 8-jointed, 1st joint elongate, strongly setose, accessory flagellum elongate. Antenna 2 elongate in adult ♂, extending to end of pleon segment 1, upper margin of peduncle setose. Epistome and upper lip not projecting below lateral angles of head.

Peraeopods 3–5, 2nd joints usually with simple marginal teeth.

Uropod 3, inner margins of both rami with long plumose setae in ♂.

The above slight differences in these specimens as compared with the Terra Nova ♀ may be ascribed to local variation, and perhaps to the effect of the preservative on the latter. The Terra Nova specimen was soft, and consequently the foveolate sculpturing, if present, was not detected. The ♂ is usually more strongly nodulose and carinate than the ♀.

DISTRIBUTION. McMurdo Sound, 205 m.

Genus **Liouvillea**, Chevr.

Chevreux, 1913, p. 138.

Liouvillea oculata, Chevr.

Chevreux, 1913, p. 139, figs. 34–36.

Occurrence: 1. St. 164. South Orkneys. 3 ♂♂ 11 mm., 2 ♀♀ 13 mm.
2. St. 175. South Shetlands. 2 ♀♀ 15–16 mm.

REMARKS. Considerably larger than Chevreux's specimens, one of which was an ovigerous ♀ 9 mm. in length.

The dorsal tooth on peraeon segment 7 is nearly obsolete in no. 1 and quite obsolete in no. 2; and in the latter the tooth on pleon segment 1 is also obsolete. All the specimens, especially the largest two (no. 2), show a dorso-lateral longitudinal groove on peraeon segment 7 and pleon segments 1–3; and the dorsum of pleon segment 3 is very shallowly indented on either side of a low medio-dorsal ridge.

Note 130 for St. 175 gives the colour as follows: "Thorax and abdomen mainly dark liver colour, due to close speckling of minute chromatophores. Thorax anteriorly with a large patch of pale greenish yellow on either side, involving coxal plates of segments 3–5 and joining dorsally on 4th segment. Posterior thoracic legs with reddish bands. Eyes dark brown".

DISTRIBUTION. Petermann Island, 3–60 m.

Genus **Cacao**, Brnrd.

Barnard, 1931, p. 427.

Rostrum minute. Eyes very large and prominent. Side-plate 1 large, as deep as side-plate 2, triangularly produced forwards; side-plate 3 shallower than 2, 4 shallower than any of the preceding; side-plates 5–7 feebly bilobed. Telson entire, apically emarginate.

Antenna 1 without accessory flagellum. Upper lip bilobed. Mandible with smooth cutting edge, large dentate secondary cutting plate in left only, no spine row or molar, palp 3-jointed, 3rd joint shorter than 2nd. Lower lip without inner lobes, outer lobes acuminate. Maxilla 1, inner lobe horizontally projecting inwards, much smaller than outer lobe, which has 15 spines on inner margin, palp with 2nd joint enormously enlarged to form a curved plate. Maxilla 2, both lobes projecting inwards. Maxilliped, outer plate not greatly exceeding inner plate, and placed laterally to it, not overlapping it, palp well developed, extending beyond apex of outer plate.

Gnathopods 1 and 2 simple, 5th and 6th joints broad.

Peraeopods 3–5, 2nd joint not strongly expanded.

Remarks. This genus seems closely allied to *Alexandrella*, Chevr., but deserves to be kept separate on account of the presence of eyes, the shape of the maxilliped, and other less important differences.

The mandibles and enormous maxillary palp are reminiscent of *Pardalisca*, but no doubt the similarity of these features is due to similar habits of life.

Alexandrella dentata, Chevr., was found in a sponge in the Antarctic regions, but there are no data with the present specimens as to how they occurred, except that they were caught in the young-fish trawl; they were, however, accompanied by typical pelagic Hyperiids and other pelagic organisms, and are therefore presumably also pelagic or bathypelagic.

The very complete protection of the mouth-parts seems to imply some special habitat. The maxillary palps fold over the mandibles, and the 1st side-plates fold over the maxillary palps. Farther back the buccal chamber is closed in by the maxillipeds and especially by the gnathopods; the thick fringes on the margins of these appendages, especially that on the hind margin of the 2nd joint of gnathopod 2, being obviously intended to strain off particles of foreign matter. Finally the 1st and 2nd peraeopods complete the protective arrangement. The nature of the bottom at the neighbouring station 274 is recorded as being muddy.

The large eyes indicate a mobile mode of life and the oar-like dactyl of peraeopod 5 seems to point also to a free-swimming mode of life.

Whether both *Alexandrella* and *Cacao* are rightly placed in the Tironidae may be debated. There is a certain superficial likeness between *Chagosia*, Wlkr. 1909, and these two genera. Walker placed his genus in the Calliopiidae provisionally, without examining the mouth-parts, and until these are examined the genus has really only a nominal status.

Cacao lacteus, Brnrd. (Fig. 90).

Barnard, 1931, p. 428.

Occurrence: St. 273. East mid-Atlantic. 8 ♂♂ 12–13 mm., 5 ovig. ♀♀ 14–15 mm., 6 immat. 9–10 mm.

Description. Body plump, especially anteriorly. Integument not indurated. Back rounded. Head longer than any of the peraeon segments, rounded in front, rostrum minute; inferior margin of head rounded, anterior margin occupied by the very large, subcircular, prominent eyes. Peraeon segment 1 equal to segment 2, the following segments gradually increasing in length. First 4 side-plates deeper than their segments; 1st largest, triangularly produced forwards, 2 a trifle deeper than 1, 3 narrow like the 2nd but a little shallower, 4 shallower than 3, inferior margin oblique, almost straight, posterior margin shallowly concave; side-plates 5–7 shallow, feebly bilobed. Pleon segments 1–3 longer than any of the peraeon segments, dorsally rounded, postero-inferior angle of 2 quadrate, of 3 somewhat produced backwards, but the actual angle quadrate, not acute. Pleon segment 4 dorsally with basal notch, followed by a medio-dorsal keel which ends abruptly. Telson longer than broad, narrowing slightly distally, apex emarginate between the subacute postero-lateral angles.

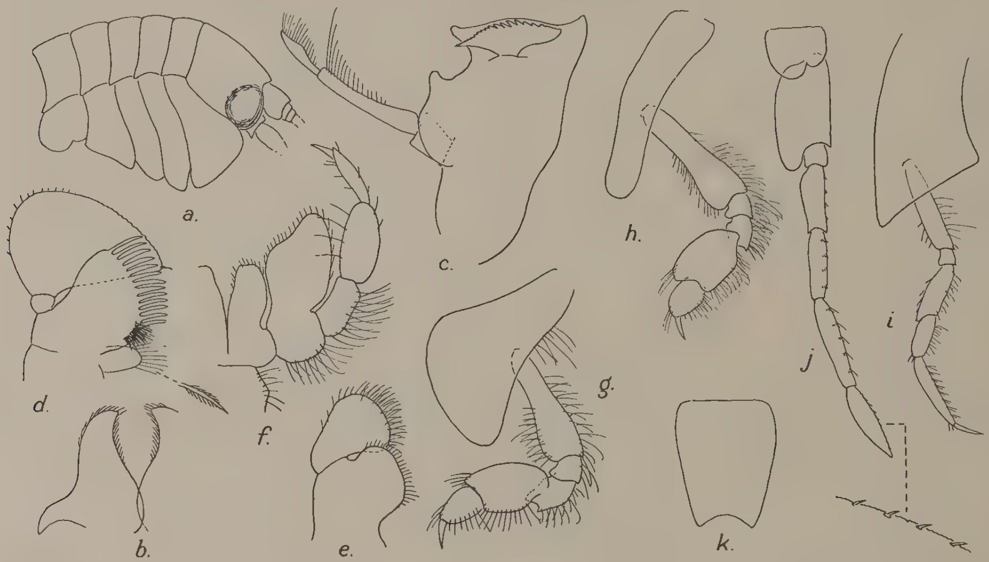

Fig. 90. *Cacao lacteus*, Brnrd. *a*. Head and peraeon segments 1–5 with side-plates and bases of antennae 1 and 2. *b*. Lower lip. *c*. Left mandible. *d*. Maxilla 1. *e*. Maxilla 2. *f*. Maxilliped. *g*. Gnathopod 1. *h*. Gnathopod 2. *i*. Peraeopod 2. *j*. Peraeopod 5, with anterior margin of 6th joint further enlarged. *k*. Telson.

Antenna 1 reaching back to about end of peraeon, 1st joint moderately stout, flagellum about 48-jointed, no accessory flagellum, lower margin of peduncle and basal joints of flagellum rather densely setose, especially in ♂. Antenna 2 a little longer than antenna 1, flagellum about 58-jointed, upper margins of 3rd–5th peduncular joints setose, the setae shorter than in antenna 1, and in the ♂ arranged in numerous fascicles.

Upper lip asymmetrically bilobed. Mandible broad, thin, cutting edge smooth, secondary cutting plate in left mandible only, large, transversely elongate, its margin dentate, palp with 3rd joint shorter than 2nd, no spine row or molar. Lower lip, inner lobes obsolete or quite rudimentary, outer lobes acuminate. Maxilla 1, both lobes projecting inwards, inner lobe much smaller than outer, which has a series of 15 evenly spaced spines on its inner margin and a dense brush of short spine-setae at the inner proximal corner, palp with 1st joint small, 2nd joint enormously expanded into a subtriangular curved lamina, its outer margin with a few spinules, its distal margin smooth, with one small spinule at rounded inner apex. Maxilla 2, both lobes large, rounded and projecting inwards. Maxilliped, outer plates set in same plane as inner plates, i.e. not overlapping the latter and therefore widely separated, not very much larger than the inner plates, palp well developed, extending beyond apex of outer plate.

Gnathopod 1, 2nd joint slightly expanding distally, 5th inserted near base of upper margin and on outer side of 4th, moderately expanded, 6th considerably shorter than 5th, broadly ovate, simple, margins of all joints, especially on hinder and lower margins, with long setae. Gnathopod 2 similar, but longer and more slender.

Peraeopods 1 and 2, 5th joint shorter than 4th and 6th, which are subequal, hind margin of 6th with fascicles of spinules. Peraeopod 2 more slender than peraeopod 1. Peraeopods 3–5 slender, 2nd joint not strongly expanded, narrow ovate, hind margin smooth.

Peraeopods 3 and 4, 4th and 5th joints subequal, shorter than 2nd, 6th elongate, longer than 2nd and nearly twice as long as 5th, anterior margin with groups of spinules, 7th one-quarter length of 6th. Peraeopod 5 as long as peraeopods 3 and 4, 6th joint only a little longer than 4th or 5th, but 7th almost as long as 6th, and slightly expanded into a narrow lanceolate form resembling the blade of an oar, its anterior margin set with spaced spinules, unguis not distinct from the joint.

Uropods 1 and 3 extending about equally far back, uropod 2 shorter; rami of uropod 1 subequal, outer ramus in uropod 2 shorter than inner, in both uropods narrow, acuminate; in uropod 3 rami subequal, narrow lanceolate, outer ramus with minute unguiform terminal joint.

The colour is recorded as "thoracic segments and legs chocolate, abdominal segments white, eyes pink". As preserved, the brown colour affects the head and peraeon segments 1–4 or 5 (though paler and seemingly bleached in the more dorsal portions), the side-plates 1–4, mouth-parts, gnathopods, peraeopods 1 and 2, together with the branchiae on gnathopod 2 and peraeopods 1 and 2. The posterior half of the peraeon, with peraeopods 3–5, and the pleon with its appendages, and the antennae are milk-white. The eyes are a pale glistening yellow. The generic and specific names have been suggested by this "chocolate and milk" coloration.

Family CALLIOPIIDAE

Stebbing, 1906, pp. 285, 727.
Schellenberg, 1925, p. 147.
Barnard, 1930, p. 369.

Genus **Clarencia**, Brnrd.

Barnard, 1931, p. 428.

No rostrum. No eyes. Peraeon segments becoming imbricate posteriorly. Pleon segments 1–3 carinate; segment 4 long. No accessory flagellum. Upper lip rounded. Lower lip with inconspicuous, apparently fused, inner lobes. Other mouth-parts normal. Gnathopod 1 subchelate. Gnathopod 2 very large, chelate. Peraeopods 1–5 subsimilar, stout. Telson and uropods ?.

Remarks. Although the character of the telson is unknown, the form for which this genus is proposed seems satisfactorily placed in the family Calliopiidae The mouth-parts, side-plates and subsimilar peraeopods fit in well with most of the other genera. There is, however, a certain resemblance to the Pleustids (cf. *Parapleustes latipes*, Sars, 1895, pl. cxxvii) and the long 4th pleon segment recalls *Lafystius*.

The name is from the locality, Clarence Island.

Clarencia chelata, Brnrd. (Fig. 91).

Barnard, 1931, p. 428.

Occurrence: St. 170. South Shetlands. 1 immat. about 13 mm.

Description. Integument not strongly indurated, smooth. No rostrum. No trace of eyes or ocular pigment. Antero-lateral angle of head rounded. Peraeon segments slightly raised on posterior margins, becoming increasingly imbricate posteriorly, segments 6 and 7 ending in a blunt medio-dorsal projection. Side-plates 1–4 moderately deep, 1 subquadrate, slightly produced forwards, 2 and 3 rounded below, 4 with lower angle narrowly rounded, and the oblique posterior margin nearly straight, 5 and 6 with posterior lobes deeper than the anterior lobes. Pleon segments 1–3 carinate, the carina on each segment ending in a sharp tooth; postero-inferior angles of segments 2 and 3 rounded-quadrate; segment 4 long, with dorsal depression between a slight basal hump and a posterior blunt dorsal ridge. Segments 5 and 6 and telson lost.

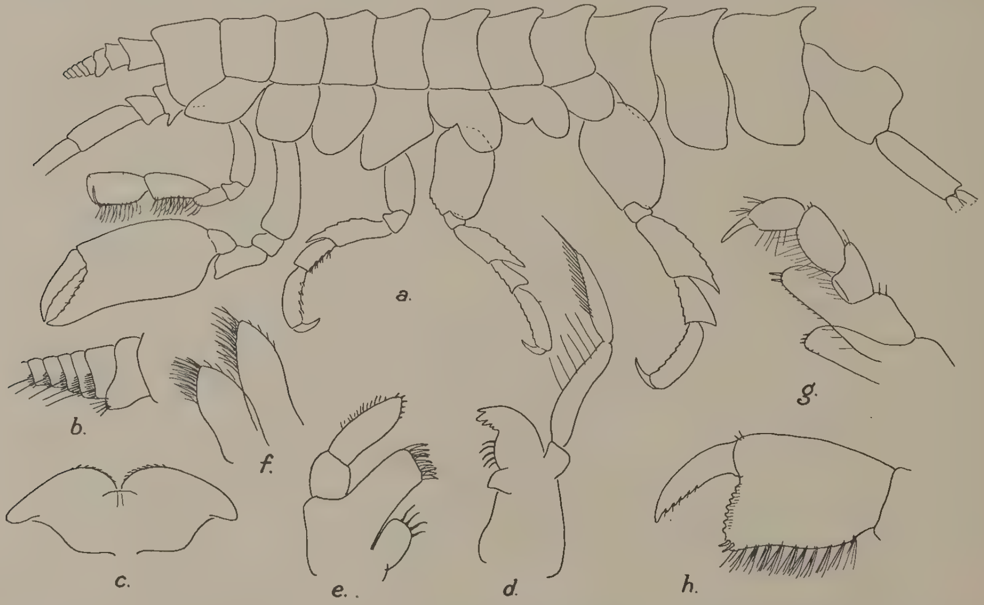

Fig. 91. *Clarencia chelata*, Brnrd. *a*. General view. *b*. 3rd peduncular joint and portion of flagellum of antenna 1. *c*. Lower lip. *d*. Mandible. *e*. Maxilla 1. *f*. Maxilla 2. *g*. Maxilliped. *h*. Gnathopod 1.

Antenna 1 stout, 1st joint with apices somewhat produced, 3rd with lower apex produced, flagellum with very short, broad joints, with rows of short spine-setae on lower distal margin, no accessory flagellum. Antenna 2 stout, broken. Upper lip apically rounded. Lower lip, outer lobes broad, transverse, inner lobes inconspicuous, apparently fused. Mandible, cutting edge dentate, spine row of five spines, molar moderate, palp large, 3rd joint a little shorter than 2nd, with a regular series of marginal setae. Maxilla 1, inner lobe with two setae, outer lobe with four large spines and one or two smaller ones, palp 2-jointed, apex with several spinules. Maxilla 2, outer lobe longer than inner, both equally broad, inner with distal setae, but proximal half of inner margin with fine setules only. Maxilliped, inner plate with three apical spinules, outer plate with setules on inner margin, and two apical spines.

Gnathopod 1, 5th and 6th joints subequal in length, 6th slightly broader than 5th, oblong, palm transverse, with rounded denticles and defined by two spines, finger matching palm, inner margin serrate. Gnathopod 2, 5th joint very small, 6th very large, oblong, lower apex produced to form a thumb, with its upper margin crenulate, finger matching thumb, its inner margin only very faintly crenulate.

Peraeopods stout, subsimilar; in peraeopods 1 and 2 anterior margin of 4th and posterior margins of 5th and 6th joints notched at insertions of the spinules; in peraeopods 3–5, 2nd joint ovate, postero-inferior angle rounded, posterior margin entire or only very faintly notched, posterior margin of 4th joint and anterior margins of 5th and 6th notched at insertions of the spinules.

Uropods lost. Branchial lamellae simple.

Remarks. It is a great pity that the single specimen of this remarkable form should be mutilated. The ends of the antennae, the 5th and 6th pleon segments and the telson and uropods are missing; the head has also been slightly injured, and only one (right) of the 2nd gnathopods is present. There will be, however, no difficulty in recognizing the species.

Genus **Chosroës**, Stebb.

Stebbing, 1888, p. 1208; 1906, p. 287.
Barnard, 1930, p. 369.

To this hitherto monotypic genus can now be added a second species, which agrees with the Challenger species in essentials, and also in possessing processes on the 2nd joints of peraeopods 1 and 2, and excised margins of 2nd joints of peraeopods 3–5, but is distinguished by an extraordinary development of dorsal keels which, on five of the segments, end in forked teeth.

Chosroës incisus, Stebb.

Stebbing, 1888, p. 1209, pls. cxxxiv, cxxxv; 1906, p. 287.
Barnard, 1930, p. 369, fig. 38.
Schellenberg, 1931, p. 175.

Occurrence: 1. St. 51. Falklands. 3 ♂♂ 6–10 mm.
2. St. WS 72. Falklands. Many ♂♂, ovig. ♀♀ and juv. up to 11 mm. from sponges.
3. St. WS 92. Between Falklands and South America. 4 ♂♂, 16 ♀♀, 8 juv. up to 8 mm. from sponge.

Remarks. The colour appears to have been a uniform creamy white, the eyes pale brown. This species would seem to be common in the deeper water area around the Falkland Islands and between these and the mainland of South America.

Distribution. Off Cape Virgins, 55–70 fathoms; west of Falkland Islands, 229 m.

Chosroës decoratus, n.sp. (Fig. 92).

Occurrence: St. 170. South Shetlands. 1 ♂ 20 mm., 1 ovig. ♀ 22 mm.

Description. Integument moderately indurated, with numerous minute ridge-like granules causing a granulate appearance; these granules are arranged mostly transversely, and are more distinct and prominent on the pleon segments, but extend also over the 2nd joints of peraeopods 3–5. Head with short median point, ocular angles rounded, post-antennal angles quadrate, hidden under 1st side-plates. Eyes large, subrotund. Peraeon broadly rounded in anterior portion, the posterior margins of segments 1–4 slightly thickened; segments 5–7 with medio-dorsal keel, which is largest on segment 7, and on all three segments ends posteriorly in a forked tooth; postero-inferior angles of segments 5–7 becoming increasingly prominent and produced; posterior margins of segments 6 and 7 with a lateral tooth between the dorsal one and the postero-inferior angle. Side-plates shallow, 1 and 2 rounded, 3 subquadrate, 4 trapezoidal, excavate behind, 5 and 6 with the anterior and posterior lobes subequal, 7 oblong. In the ♀ the lateral tooth on segment 6, the postero-inferior angles of segments 6 and 7 and the posterior angle of side-plate 7 are shortly bifid.

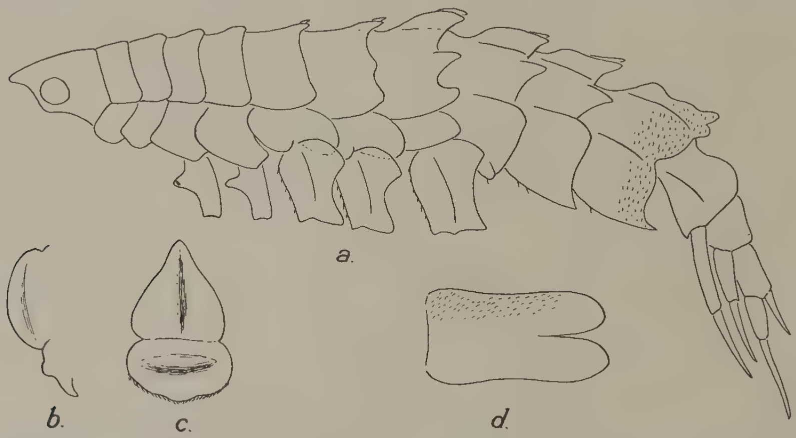

Fig. 92. *Chosroës decoratus*, n.sp. *a*. General view, sculpturing indicated on pleon segment 3. *b*, *c*. Profile and frontal views of epistome and upper lip. *d*. Telson, with sculpturing indicated.

Pleon segments 1–3 carinate, carina forming a forked tooth on segments 1 and 2, and a simple tooth on segment 3; a lateral tooth on hind margin in segments 1 and 2; postero-inferior angle of pleon segment 1 quadrate, of segments 2 and 3 produced in a sharp point; segment 4 with a low rounded dorsal keel, which is notched below the posterior apex; segments 5 and 6 smooth. There is also a slight lateral ridge or fold on segments 1–3, and a more faintly marked one on segment 4 also. Telson nearly twice as long as broad, cleft nearly to half-way, each lobe with broadly rounded apex.

Antenna 1 extending to end of pleon segment 3 in ♂, shorter in ♀, flagellum calceoliferous, no accessory flagellum. Antenna 2 extending to end of uropods in ♂, shorter in ♀, flagellum calceoliferous. Epistome with a median keel, rounded in profile. Upper lip with low transverse ridge, margin rounded. Lower lip with rudimentary inner lobes. Other mouth-parts as in *incisus*. Inner lobe of maxilla 1 has two setae on *inner* apex (cf. Stebbing's figure on pl. cxxxv). Palp of mandible stout, 2nd joint angular on inner margin near base, 3rd joint falcate.

Gnathopods 1 and 2 similar to those of *incisus*, but the palm more oblique. Peraeopods 1 and 2 as in *incisus*, with a similar but narrower and sharper process on middle of anterior margin of 2nd joint. In the ♀ these processes are broader than in the ♂, and are slightly serrulate on lower margin. Peraeopods 3–5 also similar to those of *incisus*, but the hind margin of 2nd joint is excavate to a much greater extent, margin entire, postero-inferior angle quadrate.

Uropods as in *incisus*. Branchial lamellae simple, oostegites large.

Remarks. As preserved both specimens are pale yellowish, with brown eyes; the eggs orange.

Genus **Halirages**, Boeck.

Stebbing, 1906, p. 290.
Schellenberg, 1929 *a*, p. 275.

Schellenberg has shown that *Bovallia regis*, Stebb., should be transferred to this genus.

Halirages huxleyanus (Bate) (Fig. 93).

Bate, 1862, p. 135, pl. xxv, fig. 4 (♂).
? Cunningham, 1871, p. 498, pl. lix, fig. 9 (*Atylus batei*) and p. 498 (*huxleyanus*).
Non Stebbing, 1888, p. 902, pl. lxxiii and 1906, p. 291.

Occurrence: 1. St. 53. Falklands. 1 ovig. ♀ 13 mm.
2. St. 55. Falklands. 1 ♀ 11·5 mm.
3. St. 56. Falklands. 1 ♂ 11 mm., 2 ♀♀ 21 mm.

Remarks. The integument is covered with minute scattered punctae, and in some lights, especially when the specimens are semi-dried, the appearance of markings resembling, as Bate says, a flying bird is seen.

The antero-lateral angle of the head is acutely produced in no. 3, but quadrate in nos. 1 and 2. The eye varies both in size and shape, being either round or horizontally oval, always with a pale margin. In the ♂ the ocular pigment forms an irregular strip along the anterior margin of the head on the right side, but on the left side there is no trace of an eye at all.

The 1st antennae are usually shorter than the 2nd, but may be subequal. Filamentous sensory setae on about every third joint in antenna 2 in both sexes. Inner lobes of lower lip indicated only by a row of setae (cf. Stebbing, 1888, pl. lxxiii). The plumose setae on the margin of the inner lobe of maxilla 1 vary from 4 to 7.

The peraeon segments are produced over the side-plates in no. 2, slightly so in no. 1, but scarcely at all in no. 3. Postero-inferior angles of peraeon segments all quadrate in nos. 1 and 3, those on segments 5–7 acutely produced in no: 2. Side-plates 1–4 not or scarcely narrowed below, rounded, slightly overlapping (cf. Bate's figure), normally deeper than long. In no. 1 side-plates 1 and 2 are about as long as deep, 3 and 4 longer than deep. Side-plate 5 with anterior lobe shallower than posterior lobe, rounded below.

In no. 1 only pleon segments 1 and 2 are produced into dorsal teeth. In all the other specimens the tooth on segment 3 is pointed like the others.

Peraeopods 3–5, 2nd joint broadly expanded; in peraeopod 3 broadly oval, with rounded postero-inferior corner; in peraeopod 4 also broadly ovoid, postero-inferior corner quadrate; in peraeopod 5 oblong narrowing below, hind margin slightly concave distally, postero-inferior corner quadrate.

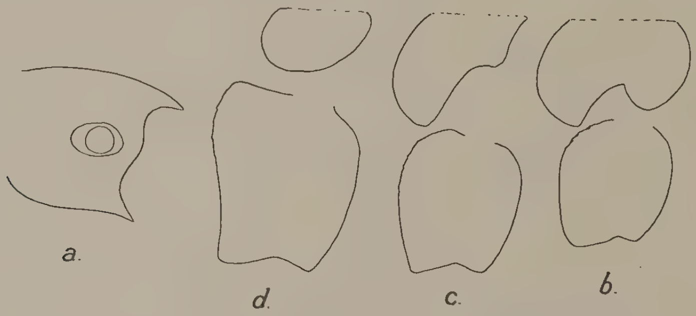

Fig. 93. *Halirages huxleyanus* (Bate). *a*. Head, with two forms of eye shown. *b*, *c*, *d*. Side-plates 5–7 and 2nd joints of peraeopods 3–5 respectively.

The variations in the few specimens in the present collection are set out with a view to diagnosing a little more stringently the species described by Bate. I have no hesitation in assigning them to his species.

On the other hand, I am of opinion that Stebbing's identification of the Challenger specimen as *huxleyanus* was erroneous, but that he relied more on Bate's figure than on the Challenger figure when he described *Bovallia regis* in 1914, in spite of the figure of the latter appearing to bear much more resemblance to the Challenger figure of *huxleyanus* than to Bate's figure, which is proved to be accurate by the present specimens. If the Challenger specimen is regarded as the same as Bate's species (as Stebbing does in 1914, p. 362) surely *regis* must be synonymous. This solution of the confusion, however, does not commend itself after a careful comparison of Bate's and Stebbing's figures, and especially when one places the actual specimens alongside one another. It is certainly strange that Stebbing distinguished both forms without, however, commenting on their extraordinary resemblances (telson, etc.).

A certain amount of doubt attaches to Cunningham's specimens, but that is immaterial both from a nomenclatorial and a geographical point of view.

The colour of no. 3 is given as "pale olive-brown with pink eyes".

Distribution. Hermite Island; ? Magellan Strait.

Halirages regis (Stebb.) (Fig. 94).

Stebbing, 1888, p. 902, pl. lxxiii (*huxleyanus*, *non* Bate); 1906, p. 291 (*huxleyanus*, *non* Bate); 1914, p. 362, pl. viii (*Bovallia r.*).

Occurrence: St. 56. Falklands. 1 ovig. ♀ 14 mm.

Remarks. Very close to *huxleyanus* but at once distinguished by the strong imbrication of the peraeon segments over the side-plates, by side-plates 1–5, and by the 2nd joints of peraeopods 3–5, especially peraeopod 3.

Side-plates 1–4 subtriangular, narrowing below, not overlapping, but separated almost from their bases. Anterior lobe of side-plate 5 as deep as, and diverging rather strongly from the posterior lobe, subacute below. In this respect Stebbing's 1914 figure of the whole animal does not conform, but he gives no detailed figure.

Eye much larger than in any of the specimens of *huxleyanus*, obliquely oval.

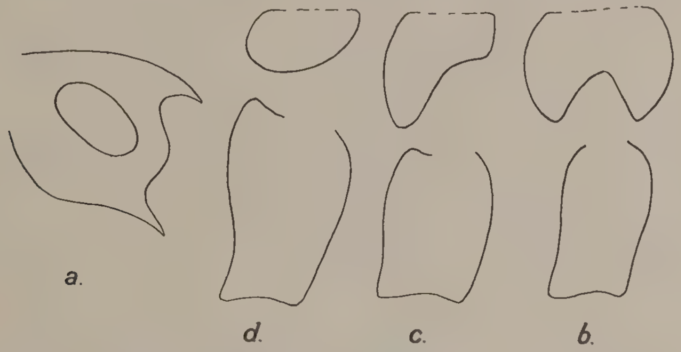

Fig. 94. *Halirages regis* (Stebb.). *a*. Head. *b*, *c*, *d*. Side-plates 5–7 and 2nd joints of peraeopods 3–5 respectively.

Peraeopod 3, 2nd joint comparatively narrow, oblong, hind margin straight. Peraeopod 4, 2nd joint also oblong but broader. Peraeopod 5, 2nd joint oblong, but narrowing distally, hind margin distally concave. Postero-inferior corners in all three peraeopods quadrate.

The colour is given as "white very heavily mottled with deep crimson".

There is no question but that for the present these two forms should be kept separate. Stebbing (1914, p. 362) says that Mr Vallentin "on March 11th...found the sea teeming with it [*huxleyanus*]". If a few hundreds of specimens could be captured and examined, the status of *huxleyanus* and *regis* might be satisfactorily determined.

Distribution. Falkland Islands.

Genus **Stenopleura**, Stebb.

Stebbing, 1906, p. 302.

Stenopleura atlantica, Stebb.

Stebbing, 1888, p. 950, pl. lxxxiv.
Stephensen, 1915, p. 45, fig. 27.
Schellenberg, 1926, p. 353; 1926 *b*, p. 227.

Occurrence: 1. St. 87. South-east Atlantic. 4 ♂♂ 6·5–7 mm., 8 ♀♀ (2 ovig.) 6·5–7 mm.
2. St. 89. South Africa. 5 ♂♂ 5–8 mm., 1 ovig. ♀ 6·5 mm.
3. St. 250. South Atlantic. 1 ♂ 6 mm.
4. St. 256. South-east Atlantic. 1 ♂ 7 mm., 1 ♀ 8 mm.
5. St. 257. South-east Atlantic. 3 ♀♀ 6·5–7 mm.
6. St. 266. South Africa. 1 ♂ 6·5 mm., 2 ♀♀ 6–7 mm.

REMARKS. As preserved the eye is red, and the whole head and mouth-parts are tinged with a paler but brighter shade of red; the animals are consequently rather distinctive and easily picked out from amongst a mixed lot.

The telson varies considerably, even in specimens from the same haul. The apex between the lateral points may be convex, irregularly crenulate, or emarginate. In the latter case the apex might be described as truncate with four short points separated by notches. The lateral points themselves may be minutely notched or bifid.

Except that the antennae are rather longer in the ♂, there appear to be no constant sexual differences in the size of the eyes or the slenderness of the peraeopods.

Nos. 3, 5, 6 from the lesser depths of 300–0 m. are night captures, so that there appears to be a nocturnal upward migration.

The 'Discovery' has taken ovigerous ♀♀ in mid-winter (South Atlantic); this is in contrast with the findings of other expeditions in which the breeding season seems to be summer: September to February (cf. Schellenberg).

DISTRIBUTION. Atlantic, 36° N–36° S; Indian Ocean; Antarctic ('Gauss' winter station).

Genus **Oradarea**, Wlkr.

Walker, 1903, pp. 40, 56.
Shoemaker, 1930 (*Studies Biol. St. Canada*, N.S. v, no. 10), p. 81.

After having written the account of the Discovery material and suggested the resurrection of Walker's genus to receive the Antarctic species which are quite distinct from the New Zealand *Leptamphopus*, I saw Shoemaker's paper. I am glad to see that, even without actual New Zealand specimens, he has come to the same conclusion.

I have to thank Miss Herriott of Canterbury College, Christchurch, for some specimens of *Leptamphopus novae-zealandiae* from the collection of the late Dr Chilton. While leaving the full description of the species to some New Zealand carcinologist, I give a few details and figures (Fig. 95) in order to substantiate my contention that, contrary to Chilton's opinion (1912, p. 489), the wide distribution of the New Zealand species has yet to be proved. In my view it is strictly a New Zealand species.

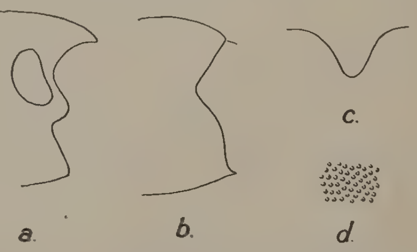

Fig. 95. *Leptamphopus novae-zealandiae* (Thoms.). *a*. Head. *b*. Pleon segment 3. *c*. Dorsal view of tooth on pleon segment 1. *d*. Integumentary sculpture.

The dorsal processes in *novae-zealandiae*, when seen in dorsal view, are not acute, scarcely subacute, but merely rounded. Pleon segment 3 is feebly carinate, and the carina not at all raised. Postero-inferior angles of pleon segments 1–3 ending in small acute points, that on segment 1 very small. Side-plate 1 oblong (cf. Chilton, 1920, fig. 1); none of the side-plates serrulate, or only very obscurely so. Hind margin of 2nd joint in peraeopods 3–5 feebly serrulate. Gnathopod 1, 6th joint subequal to 5th, tapering slightly distally, palm oblique, convex. Peduncle of uropod 3 produced on lower inner apex in a short process for the reception and support of the inner ramus (cf. ventral view given by Chilton, 1920, fig. 5). The inner ramus is not at all flattened, but triquetral in cross-section. The whole integument is covered with an exceedingly fine and regular pitting.

The last character decisively separates *novae-zealandiae* as a species from the Antarctic species here described.

On the other hand, these latter species all agree with the New Zealand species in the character of the peduncle and inner ramus of uropod 3. The triquetral shape of the inner ramus appears also in *O. longimanus*, Boeck (cf. Shoemaker, 1930, p. 88, fig. 37 *e*), but the prolongation of the peduncle seems to be very slight or even absent (cf. the same figure). These features are not utilized by Shoemaker in his discussion of the generic characters of *Leptamphopus* and *Oradarea*. Both appear to be absent in *Leptamphopus longimanus*, Sars (= *sarsi* Vanhöff.), judging from Sars' pl. clxii (1895).

Shoemaker includes in the genus the northern *longimanus*, Boeck, non Sars, and thus proposes the name *walkeri* for Walker's preoccupied "*longimana*". He also suggests that *novae-zealandiae* might be placed temporarily in *Halirages*. With the qualification "temporarily" I agree; a new genus would be more suitable.

Oradarea tridentata, n.sp. (Figs. 96 *a*, 97).

? Chilton, 1912, p. 488 (*Leptamphopus novae-zealandiae*, *non* Thoms.).

? Chevreux, 1913, p. 143 (part, *Leptamphopus novae-zealandiae*, *non* Thoms.).

Occurrence:
1. St. 123. South Georgia. 1 ♂ 10 mm.
2. St. 141. South Georgia. 11 ovig. ♀♀ 10–11 mm.
3. St. 142. South Georgia. Many ♂♂, ovig. ♀♀ and immat. up to 11 mm. from cup sponge.
4. St. 145. South Georgia. 2 ♂♂ 6 and 8 mm., 16 ♀♀ (12 ovig.) 10–12 mm. *Types*.
5. St. 149. South Georgia. 1 ♀ 10 mm., 1 ovig. ♀ 11 mm.
6. St. WS 25. South Georgia. 1 ♀ 10 mm.

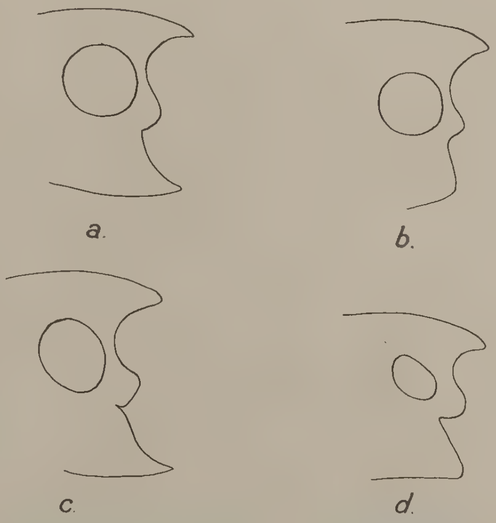

Fig. 96. Heads of *Oradarea*. *a. tridentata* and *tricarinata*. *b. bidentata*. *c. impressicauda*. *d. edentata*.

7. St. MS 6. South Georgia. 1 ♀ 11·5 mm.
8. St. MS 68. South Georgia. Many, incl. ovig. ♀♀ from roots of giant sponge.
9. St. MS 74. South Georgia. 4 ♂♂ 6–8 mm., 2 juv. 4–5 mm.

Description. Integument with elongate or scale-like pits, arranged horizontally in front part of body, gradually becoming oblique and then transverse on the pleon segments; still finer scale-like markings between the major pits.

Eyes subcircular, rather large, reddish (as preserved). Post-antennal angle of head acutely produced. Side-plate 1 widening below; all the side-plates serrulate on lower margins. Peraeon segment 7 and pleon segments 1 and 2 each with a dorsal tooth, which is acute when seen in dorsal view. Pleon segment 3 with a raised carina, rounded in profile. Postero-inferior angle of pleon segment 1 with a short acute point, of segment 2 with a strong, slightly curved point, of segment 3 with an upturned acute point some little distance above the lower margin, with a deep semicircular notch above it. Telson subtriangular, the lateral margins narrowing rather abruptly at about two-thirds the length, the apical margin entire or feebly notched, each notch with a setule.

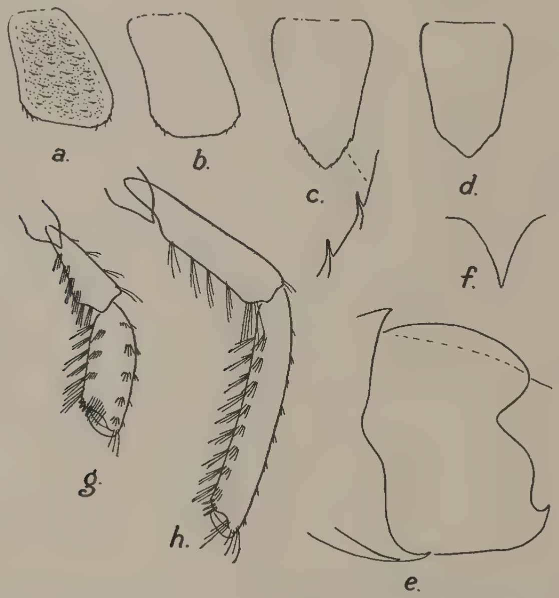

Fig. 97. *Oradarea tridentata*, n.sp. *a*. Side-plate 1 with sculpture. *b*. Side-plate 2. *c*. Telson with margin further enlarged. *d*. Telson of feebly notched variety. *e*. Pleon segments 2 and 3. *f*. Dorsal view of tooth on pleon segment 1. *g*. Gnathopod 1. *h*. Gnathopod 2.

Epistome and upper lip gibbous, subcarinate medially.

Antenna 1 with a minute 1-jointed accessory flagellum.

Gnathopod 1, 6th joint broader than in *novae-zealandiae*, slightly though distinctly longer than 5th, not narrowing distally, palm slightly oblique, concave, defined by a blunt angle and about six spines (four on one side, two on the other). Gnathopod 2, 6th joint obviously longer than 5th, palm slightly oblique and concave, defining angle with three spines.

Peraeopods 3–5, 2nd joint with hind margin distinctly serrate.

Uropod 3, peduncle and rami as described above for *novae-zealandia*.

Remarks. The tooth of peraeon segment 7 is often absent in juvenile examples. The notching on the telson is variable, but the general shape of the telson is constant and easily distinguished from that of the other species.

It is probable that some at least of Chevreux's specimens were the same as these. He records that the specimens before him had either three, or two, or no dorsal teeth; but the postero-inferior angle of pleon segment 3 does not seem to have been examined.

I must confess that in studying the Terra Nova collection the current opinion as to a "widely distributed" species probably allayed the critical faculties. A re-examination of the two specimens from the Antarctic recorded in that report would, I expect, prove them to be distinct from the New Zealand species, and either this or the next species.

Oradarea bidentata, n.sp. (Figs. 96 *b*, 98).

? Walker, 1903, p. 56, pl. x, figs. 77–89 (*O. longimana*).
? Barnard, 1930, p. 369 (part, *Leptamphopus novae-zealandiae*, *non* Thoms.).

Occurrence: 1. St. MS 67. South Georgia. 4 ♂♂ 8–10 mm., 2 ♀♀ 10–11 mm., 3 ovig. ♀♀ 9–10 mm. *Types*.
2. St. MS 71. South Georgia. 9 ♀♀ 6–8 mm.
3. St. MS 74. South Georgia. 7 ♂♂ 9–10 mm., 1 ♀ 11 mm., 1 ovig. ♀ 9 mm.

Description. Integument as in *tridentata*. Only pleon segments 1 and 2 with dorsal teeth, which are acute when viewed dorsally.

Post-antennal angle of head rounded-quadrate. Eyes subcircular, rather large, pale. Postero-inferior angle of pleon segment 2 with a short point, of segment 3 broadly rounded, with a small notch on posterior margin. Side-plate 1 slightly widened below. All side-plates obscurely serrulate. Telson oblong but tapering distally to the bluntly rounded apex.

Epistome and upper lip gibbous, subcarinate. Antenna 1 with 1-jointed accessory flagellum.

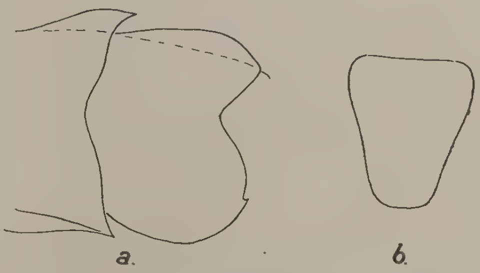

Fig. 98. *Oradarea bidentata*, n.sp. *a*. Pleon segments 2 and 3. *b*. Telson.

Gnathopod 1, 6th joint subequal to 5th, somewhat tapering distally, palm oblique, not concave. Gnathopod 2, 6th joint slightly longer than 5th, palm slightly convex.

Peraeopods 3–5, 2nd joint with hind margin obscurely serrulate.

Remarks. I do not really think these specimens are the same as Walker's; his figure of the postero-inferior angle of pleon segment 3 does not fit any of the specimens in the Discovery collection, though perhaps it is nearest to that of *impressicauda* (*infra*). The Southern Cross material should be re-examined.

Oradarea tricarinata, n.sp. (Figs. 96 *a*, 99).

Occurrence: 1. St. 144. South Georgia. 1 ovig. ♀ 11 mm.
2. St. 172. South Shetlands. 2 ♀♀ (1 ovig.) 17 mm.
3. St. 175. South Shetlands. 1 ♂ 12 mm., 6 ♀♀ 13–15 mm. *Types.*

DESCRIPTION. Integument with major sculpturing as in *tridentata*, but the interspaces between the elongate pits or ridges filled with exceedingly minute and regular pitting. Post-antennal angle of head acutely produced. Eyes subcircular, rather large, pale. Peraeon segment 7 with a strong dorsal tooth. Pleon segments 1–3 strongly carinate, the carina ending in a sharp tooth on segments 1 and 2, rounded at each end on segment 3. A lateral keel on peraeon segments 6 and 7 and pleon segments 1 and 2, ending in a sharp tooth, smallest on peraeon segment 6. Postero-inferior angle of pleon segment 1 rounded, of 2 ending in a short point, of segment 3 broadly rounded with a small notch on the lower margin. Side-plate 1 widening below. All side-plates with lower margin serrulate. Telson subquadrangular, broad, apex truncate, with some minute irregular crenulations.

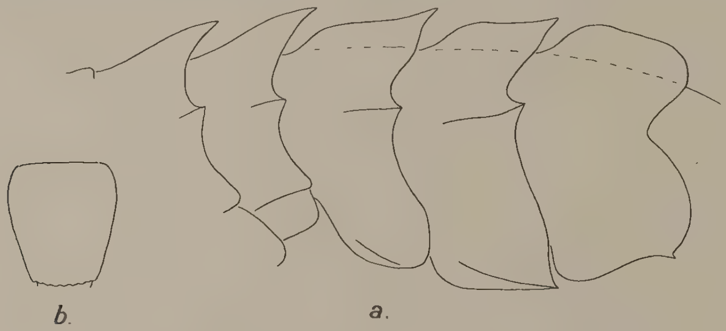

Fig. 99. *Oradarea tricarinata*, n.sp. *a*. Peraeon segments 6 and 7 and pleon segments 1–3. *b*. Telson.

Epistome and upper lip gibbous and subcarinate. Antenna 1 with 1-jointed accessory flagellum.

Gnathopods 1 and 2, 6th joint as in *tridentata*. Peraeopods 3–5, 2nd joint with hind margin feebly serrulate.

The single specimen from St. 144 has a dorsal tooth and a lateral tooth on each side on peraeon segment 6 as well as on segment 7, but is otherwise exactly similar to those from St. 175. Both specimens from St. 172 show a short obtuse dorsal point on peraeon segment 6 and the lateral teeth are not so well developed as in the other specimens.

Oradarea impressicauda, n.sp. (Figs. 96 *c*, 100).

Occurrence: St. 170. South Shetlands. 1 ♀ 15 mm.

DESCRIPTION. Integument sculptured as in *tridentata*, rather strongly so, the pits tending to form transverse lines on the pleon, the pitting extending on to 2nd joints of peraeopods 3–5. Post-antennal angle of head acutely produced. Eyes subcircular, rather large, pale. Peraeon segments dorsally rounded; segment 7 with a very feeble mediodorsal denticle on posterior margin. All the side-plates serrulate on lower margin. Pleon segments 1–3 carinate, the carina on segments 1 and 2 ending in a sharp tooth, on segment 3 rounded. Postero-inferior angle of pleon segment 3 rounded with a small tooth and a notch above it. Telson triangular, laterally produced at base into a rounded lobe, apex rounded, feebly notched, dorsal surface with two shallow impressions basally, and a deeper concavity distally.

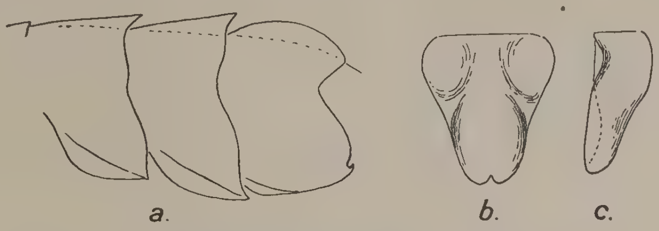

Fig. 100. *Oradarea impressicauda*, n.sp. *a*. Pleon segments 1–3. *b*, *c*. Dorsal and lateral views of telson.

Epistome and upper lip gibbous, subcarinate medially.

Gnathopods 1 and 2 as in *tridentata*.

Oradarea edentata, n.sp. (Figs. 96 *d*, 101).

? Chevreux, 1913, p. 143 (part, *Leptamphopus novae-zealandiae*, *non* Thoms.).

Occurrence: St. 173. South Shetlands. Many incl. ovig. ♀♀ up to 6 mm.

Description. Integument as in *tridentata*, but with the major sculpturing not forming such prominent transverse lines on the pleon segments as in the preceding species. Post-antennal angle of head quadrate, slightly produced forwards. Eyes broadly oval, reddish. Peraeon and pleon dorsally rounded, without any teeth or carination. Side-plate 1 scarcely widened distally. Lower margins of side-plates very obscurely serrulate. Postero-inferior angle of pleon segment 2 quadrate, with a very minute tooth, of segment 3 rounded with a small tooth or notch at the junction of lower and hind margins. Telson oblong, narrowing distally, apex truncate, with or without obscure crenulations. It is narrower than in *bidentata*, and without the distinct triangular apex of *tridentata*.

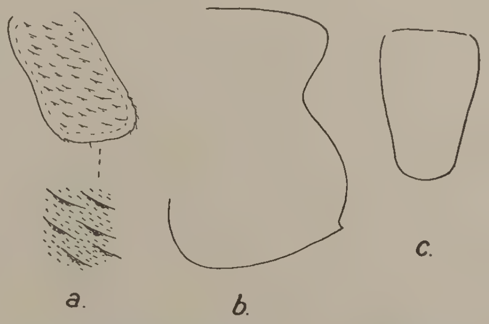

Fig. 101. *Oradarea edentata*, n.sp. *a*. Side-plate 1 with integumentary sculpture further enlarged. *b*. Pleon segment 3. *c*. Telson.

Epistome and upper lip much less gibbous than in the other species. Antenna 1 with 1-jointed accessory flagellum.

Gnathopod 1, 6th joint slender and cylindrical, approaching in shape, though not in length, the 6th joint of gnathopod 2. Peraeopods 3–5, 2nd joint with hind margin obscurely serrulate.

Colour (as preserved) orange-brown, formed by numerous close-set stellate chromatophores; eyes darker, reddish-brown.

REMARKS. It is probable that some of Chevreux' specimens from Petermann Island belong to this species. He refers to an ovigerous ♀, 6 mm. in length, without any dorsal teeth. He also mentions that some examples had a punctuated coloration, with brick-red eyes. The respective localities are not very far distant from one another.

Family PLEUSTIDAE

Stebbing, 1906, pp. 309, 728.

The only Pleustid hitherto recorded from the southern hemisphere is *Mesopleustes abyssorum* (Stebb.) from Marion Island.

Genus **Austropleustes**, Brnrd.

Barnard, 1931, p. 428.

Rostrum short. Side-plates moderate. Antennae slender, elongate. Upper lip incised. Outer lobes of lower lip widely separated. Mandible with molar feeble, conical, setulose; 3rd joint of palp shorter than 2nd. Palp of maxilliped with 3rd joint apically produced as in *Stenopleustes* (Fig. 103 *f*). Gnathopods 1 and 2 subchelate, rather slender. Dactyls of peraeopods 1–5 with a denticle at base of unguis. Uropod 3 with peduncle apically produced on lower margin to support the rami, of which inner is much longer than outer, and triquetral in cross-section. Telson more or less boat-shaped, apically more or less notched. Genotype: *A. cuspidatus* n.sp.

REMARKS. The mouth-parts of the species described below are in agreement with those of *Stenopleustes*, except the molar of the mandible, which is rather feeble but not as feeble as in *Pleustes* and *Neopleustes*. This feature, in conjunction with the peduncle of uropod 3, warrants generic separation. The structure of the peduncle of uropod 3 may be compared with that of *Oradarea* described above, or that of *Liouvillea*.

Austropleustes cuspidatus, Brnrd. (Fig. 102).

Barnard, 1931, p. 428.

Occurrence: St. 170. South Shetlands. 2 ♀♀ (1 ovig.) 15 mm.

DESCRIPTION. Integument (as preserved) moderately firm, with minute, transversely elongate granules, chiefly on the hinder half of body. Rostrum extending to just half-way along 1st joint of antenna 1. Eyes large, round-oval, yellowish. Head and peraeon segments 1–5 feebly carinate. Peraeon segments 6 and 7 each with a pair of dorsal cusps; segment 7 with a lateral tooth on posterior margin, nearer the side-plate than the dorsal cusps. Side-plates, as in *S. nodifer* (Sars, 1895, pl. cxxv, fig. 2). Pleon segments

1–3 carinate, the carina on segments 1 and 2 raised posteriorly into a strong pointed tooth, on segment 3 rounded. Postero-inferior angle of segment 3 shortly pointed. Telson boat-shaped, apex slightly incised, a small subterminal notch on lateral margin.

Both antennae elongate, slender, flagella multiarticulate. Mouth-parts as in *S. malmgreni* (Sars, 1895, pl. cxxv, fig. 1), except that the mandible has a rather feeble conical molar, minutely setulose at apex; cutting edge with about 10 teeth, secondary cutting plate in left mandible with about eight teeth, in right mandible bidentate.

Gnathopods 1 and 2, 2nd joint shallowly channelled in front, outer margin slightly lobed at distal end, 4th with a short sharp spine at lower distal angle, 5th and 6th subequal, rather elongate, both setose along lower margins, 5th with two rather stronger spine-setae distally, 6th cylindrical, palm oblique, not defined except by three stout submarginal spines, finger overlapping palm.

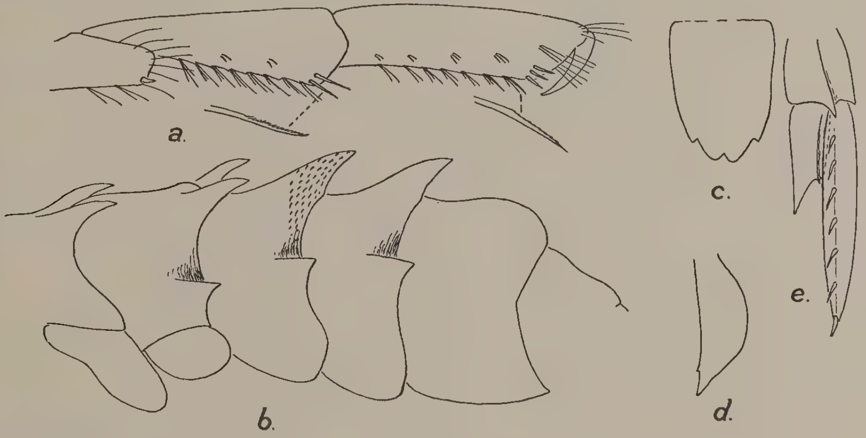

Fig. 102. *Austropleustes cuspidatus*, Brnrd. *a*. Gnathopod 1. *b*. Peraeon segments 6 and 7, and pleon segments 1–4. *c*, *d*. Dorsal and lateral views of telson. *e*. Dorsal view of uropod 3 (inner ramus missing).

Peraeopods 1 and 2, 5th and 6th joints rather strongly spinose on hind margin, dactyls with a small denticle at base of unguis. Peraeopods 3–5, 2nd joint ovately expanded, hind margin shallowly notched, 5th and 6th joints rather strongly spinose on anterior margins, dactyls with denticle as in peraeopods 1 and 2.

Uropods 1 and 2, peduncle longer than rami in uropod 1, shorter than the rami in uropod 2. Uropod 3, peduncle with upper margin keeled and ending in a short tooth, produced below into a channelled process for the reception of the inner ramus, which is lost in both specimens, but is presumably elongate.

Remarks. Distinguished from all other Pleustids by the dorsal armature.

Austropleustes simplex, n.sp. (Fig. 103).

Occurrence: St. 123. South Georgia. One specimen 8 mm.

Description. Integument (as preserved) not firm, minutely and regularly shagreened. Rostrum extending scarcely to half-way along 1st joint of antenna 1. Eyes rather large, reniform, yellowish. Postantennal angle of head shortly produced in an acute point.

Peraeon and pleon without any carinae or processes. Side-plate 1 widened below, feebly serrulate; side-plates 5 and 6 more evenly bilobed than in *cuspidatus* or *Stenopleustes nodifer*. Postero-inferior angle of pleon segment 3 quadrate, the hind margin nearly straight, and obscurely crenulate. Telson not so strongly boat-shaped as in *cuspidatus*, apex more deeply incised, each lobe with 3–4 denticles, with fine setules in the notches.

Mouth-parts as in *S. malmgreni* (Sars, pl. cxxv, fig. 1) except that the molar agrees with that of *cuspidatus* (*supra*) in being rather feeble and conical.

Gnathopods 1 and 2 in general like those of *cuspidatus*, but 5th and 6th joints not so elongate. Peraeopods 1–5 all have the denticle on the dactyl. Hind margin of 2nd joints of peraeopods 3–5 serrate.

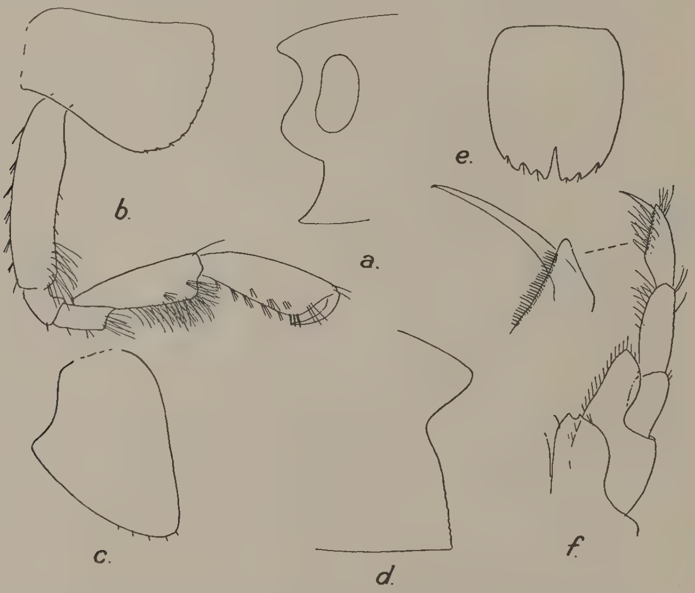

Fig. 103. *Austropleustes simplex*, n.sp. *a*. Head. *b*. Side-plate 1 and gnathopod 1. *c*. Side-plate 4. *d*. Pleon segment 3. *e*. Telson. *f*. Maxilliped, with 3rd and 4th palpal joints further enlarged.

Uropod 3, peduncle apically produced as in *cuspidatus*, inner ramus twice as long as outer, triquetral in cross-section, margins spinulose.

REMARKS. Although so unlike the preceding species in having no dorsal armature, this species agrees with the former in the mouth-parts, uropod 3, and the dactyls of peraeopods 3–5.

Family PARAMPHITHOIDAE

Stebbing, 1906, p. 320.
Barnard, 1930, p. 372.

Genus Epimeria, Costa

Stebbing, 1906, p. 321.
Barnard, 1916, p. 170; 1930, p. 372.

This genus contains a number of species which can be separated into two more or less distinct groups, characterized by the tendency of the integumentary projections to be on the one hand spiniform and on the other hand tuberculiform. Admittedly there is no hard and fast division, but taking the Antarctic examples one would at first sight be inclined to doubt whether *macrodonta* and *robusta* belonged to the same genus.

In the Antarctic fauna the *macrodonta* group causes no trouble. But in what may be termed the *inermis-robusta* group we find a number of very closely allied forms which illustrate in varying degrees the tendency among so many polar forms to develop integumentary processes.

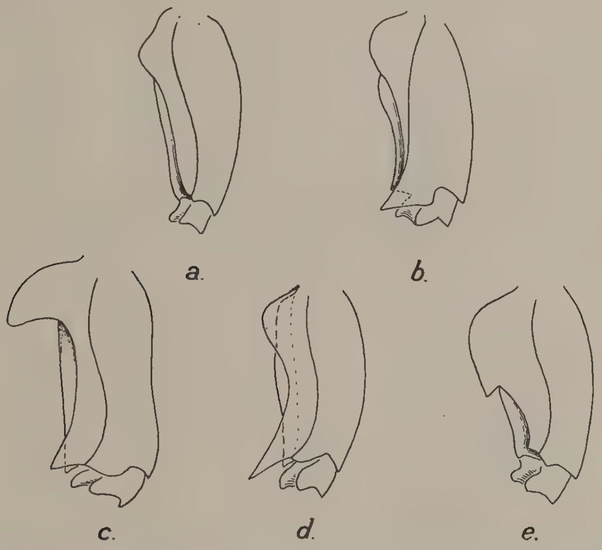

Fig. 104. 2nd and 3rd joints of peraeopod 3 of *Epimeria* viewed obliquely from behind: *a. inermis*, Wlkr. *b. acanthurus*, Schell. *c. intermedia*, Schell. *d. puncticulata*, Brnrd. *e. excisipes*, n.sp. (In *d* the faintly dotted line indicates the bottom of the channel formed by the inner and outer keels.)

These are mostly large forms and hence are amenable to a somewhat closer scrutiny than many smaller forms. Thus in the study of the Discovery material I have become aware of one feature which would seem to be of considerable value in diagnosing the species. Unfortunately the three species in the Terra Nova collection were so clearly differentiated on the more obvious features that the detail to which I am here drawing attention did not obtrude itself. That, however, is of little consequence as two of those species occur in the Discovery collection, and it is only *robusta* that I am not able to include in the following comparison.

The 2nd joints of peraeopods 3–5 have participated to a greater or lesser degree in the general induration of the integument in these forms, for the purpose of closing the gap between the 4th and 5th side-plates and the pleura of the pleon segments when the animal is curled up. They thus become available for the development of rib-like strengthening keels, marginal flanges and spiniform projections.

The simplest development is seen in the northern *cornigera*, where the hind margin of the 2nd joint in peraeopods 3 and 4 is channelled, the channel being bounded by a keel or flange on the outer and inner sides. These keels diverge right from the base of the joint, and continue separate to the end, where the outer one is expanded into a lobe. On peraeopod 4 the inner keel is slightly expanded. On peraeopod 5 it is always the outer keel which is variously expanded, and we need not consider this peraeopod any further.

All three peraeopods have a longitudinal keel in the middle of the outer surface of the 2nd joint, and the 3rd joint also possesses an outer and inner flange on the hind margin for the reception of the 4th joint when the limb is flexed.

In the Antarctic forms we find several modifications of the simple channel of *cornigera*. In explanation of the figures here given (Fig. 104) of all the species in the present collection, it will suffice to point out how important it is in descriptions to distinguish the point of divergence of the outer and inner keels, which keel is expanded, and the course of the lateral longitudinal keel.

Epimeria macrodonta, Wlkr. (Fig. 105).

Walker, 1907, p. 24, pl. viii, fig. 14.
Chevreux, 1913, p. 148 and p. 149, figs. 41–43 (*similis*).
Schellenberg, 1926, p. 343.
Barnard, 1930, p. 372.

forma macrodonta, Wlkr.

Occurrence: St. 181. Palmer Archipelago. 1 juv. 10 mm.

forma similis, Chevr.

Occurrence: 1. St. 170. South Shetlands. 19 ♂♂ 12–22 mm., 16 ♀♀ 15–34 mm., 8 ovig. ♀♀ 28–32 mm., 2 ♀♀ with embryos 33 mm.
2. St. 175. South Shetlands. 2 ♂♂ 12 and 30 mm.
3. St. 181. Palmer Archipelago. 1 ? ♀ 14 mm.
4. St. 182. Palmer Archipelago. 1 ♂ 18 mm., 1 juv. 6·5 mm.

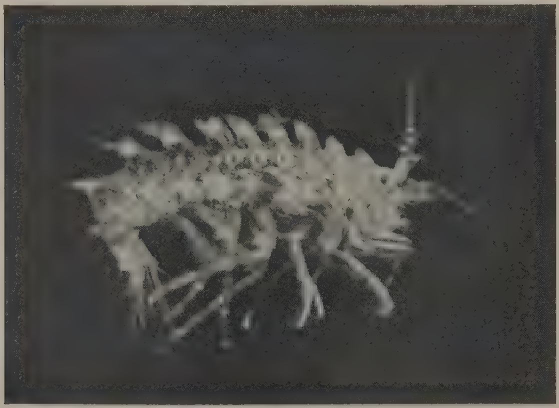

Fig. 105. *Epimeria macrodonta*, Wlkr. Photograph taken on board (St. 175).

REMARKS. The large ♂ (no. 2) is larger than any other known ♂, and the spiny armature in both specimens of no. 2 is unusually well developed. Peraeon segment 1 has a medio-dorsal subacute tooth, and a dorso-lateral short pointed tubercle. Segment 2 is unarmed, and dorsally is only half the length of segment 1. The dorsal processes on peraeon segment 3 to pleon segment 3 are high, shaped more as in *similis* than *macrodonta* in the larger ♂, *vice versa* in the smaller ♂; in the former especially those on peraeon segment 7 and pleon segments 1 and 2. The processes on segment 7 and pleon segment 2 in the larger ♂ (broken off in the smaller) are sub-bifid, the posterior point on pleon segment 2 being very narrow and acute. Side-plate 2 scarcely wider than 1. The horizontal tooth in middle of side-plate 4, which is usually short, or as in most specimens in no. 1 nearly obsolete, is here very strong, projecting laterally almost as much as does the tooth on side-plate 5.

No further evidence is required to demonstrate that *macrodonta* and *similis* are forms of the same species. The extreme forms are easily distinguished, but intergradations may occur. Many of the specimens of no. 1, especially the smaller ones, have the dorsal processes approximating to the slender *macrodonta* type.

The inter-antennal area bears two short acute median tubercles, one just below the bases of 1st antennae, the other just above the base of the epistome. These tubercles are not mentioned by other authors, and were not looked for in the Terra Nova specimens.

The colour of the no. 1 specimens is given as: "Thoracic and abdominal segments white blotched and striped with yellowish buff, antennae, antennules, distal segments of three posterior legs, and uropods suffused with same colour. Eyes shining salmon pink". Note 128 for St. 175, and Note 141 for St. 181 give the colour as: "Carapace and abdomen golden yellow, with numerous spots and streaks of bright red. Eyes salmon red", and "Pale creamy buff with faint chestnut mottling. Eyes pink", respectively.

DISTRIBUTION. McMurdo Sound; Coats Land; Graham Land; South Shetlands; 'Gauss' winter station.

Epimeria inermis, Wlkr. (Fig. 104 *a*).

Walker, 1903, p. 54, pl. x, fig. 69.
Barnard, 1930, p. 374, fig. 40 *b*.

Occurrence: 1. St. 170. South Shetlands. 6 ♀♀ 10–23 mm., 5 ovig. ♀♀ 20–28 mm., 1 juv. 6 mm.
2. St. 175. South Shetlands. 1 ♂ 13·5 mm., 2 ♀♀ 19 and 21 mm.

REMARKS. These specimens confirm the remarks made on the Terra Nova specimens. The description of the 2nd joint of peraeopods 3 and 4 can be improved, viz. hind margin forming in basal third a rounded triangular tooth or projection, then diverging into the outer and inner keels, neither of which is expanded or lobed distally, longitudinal keel distinct from base to apex.

One inter-antennal tubercle below bases of 1st antennae.

The colour of no. 1 is given as: "Cream-coloured, closely dotted all over with terracotta, 5th and 8th [*sic*] thoracic segments much darker than rest. Antennae, antennules and last five thoracic legs narrowly banded with same colour. Eyes salmon pink". When this and the following species (*excisipes*) were caught in the same haul, they were distinguished in the field and separate colour notes were made.

Distribution. Cape Adare, 28 fathoms; McMurdo Sound, 256–379 m.; west of Falkland Islands, 229 m.

Epimeria excisipes, n.sp. (Figs. 104 *e*, 106, 107).

Occurrence: 1. St. 27. South Georgia. 1 ♀ 30 mm.
2. St. 42. South Georgia. 1 ♂ 22 mm., 1 ♀ 30 mm.
3. St. 123. South Georgia. 1 ♂ 14 mm., 1 ♀ 30 mm.
4. St. 140. South Georgia. 3 ♂♂ 10, 11 and 20 mm., 4 juv. 7·5–11 mm.
5. St. 144. South Georgia. 1 ♂ 15 mm., 1 ♀ 30 mm.
6. St. 148. South Georgia. 2 ♂♂ 11–12 mm.
7. St. 156. South Georgia. 1 ♂ 17 mm.
8. St. 159. South Georgia. 3 ♂♂ 16–19 mm., 11 ♀♀ 20–31 mm., 9 ovig. ♀♀ 30–33 mm. *Types*.
9. St. 170. South Shetlands. 16 ♂♂ 16–23 mm., 6 ♀♀ 22–27 mm., 5 ovig. ♀♀ 34–39 mm., 1 ♀ with embryos 29 mm.
10. St. 175. South Shetlands. 2 ♂♂ 15–16 mm., 5 ♀♀ 14–38 mm.
11. St. 190. Palmer Archipelago (315 m.). 1 ♂ 21 mm.
12. St. 195. South Shetlands. 1 ♂ 21 mm., 1 ♀ 15 mm.
13. St. WS 33. South Georgia. 1 ovig. ♀ 31 mm.

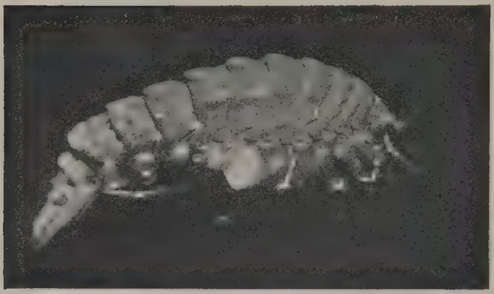

Fig. 106. *Epimeria excisipes*, n.sp. Photograph taken on board (St. 175).

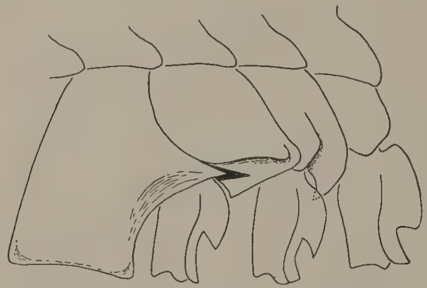

Fig. 107. *Epimeria excisipes*, n.sp. Side-plates 4–7 and 2nd joints of peraeopods 3–5.

Description. Integument, rostrum, peraeon and pleon as in *inermis* Wlkr., but side-plates 4–6 thicker and more strongly gibbose. Side-plate 4 concave on lower hind margin, lower margin straight or slightly concave, antero- and postero-inferior angles quadrate, almost sharp in some specimens. Side-plate 6 pointed below (rounded in *inermis*). The lower margins of the peraeon segments are not at all tuberculate or gibbose. Some specimens are almost foveolate on the pleura of pleon segments 1–3.

Peraeopods 3–5, 2nd joints closely resembling those of *robusta* Brnrd., but that of peraeopod 5 distinctively expanded in its proximal two-thirds into a broad lamina, bounded below by an acute re-entrant angle. In some of the smaller ♂♂ this re-entrant angle or excision on all three peraeopods is more a right angle than an acute angle.

Uropod 2, outer ramus a little over half length of inner.

One inter-antennal tubercle.

The embryos (no. 9) are 5·5 mm. in length, and the 2nd joints of peraeopods 3–5 are of the *inermis* or *tuberculata* shape. The back is feebly carinate.

REMARKS. Although closely related to *inermis* and *robusta*, this species is easily distinguished by the diagnostic characters here described and figured. Though size is not distinctive, it seems to be a larger species than *inermis*. When the animal is curled up, the manner in which the overlapping 2nd joints of peraeopods 3–5 fill in and protect the space between the 4th side-plate and the pleura of the pleon segments is very neat.

The embryos of no. 9, and the young individuals of no. 4 are interesting as showing the progressive enlargement of the basal tooth on the 2nd joints of peraeopods 3 and 4, the shifting of the point of divergence of the outer and inner keels further towards the apex of the joint, the expansion on the same joint of peraeopod 5 and its extension distalwards. As regards the shape of these joints, *excisipes* when first hatched resembles *inermis* but diverges more and more as it grows. The 4th side-plate is distinctive right from the earliest stage.

The colour of nos. 1, 2 and 9 respectively are given as: "Rose-red with red eyes", "heavily mottled with red on a creamy ground. Eyes bright pink", and "Variously mottled with milk-white on a bright red or crimson background. Some specimens mainly white, others mainly red. Eyes shining red". Note 131 for St. 175 says: "Thorax and abdomen heavily blotched and mottled with deep carmine on a pure white ground, the amount of carmine pigment varying greatly in different specimens. Last three thoracic legs dotted with carmine. Eyes shining salmon pink".

This species is very likely a synonym of *E. georgiana*, Schell. 1931, p. 160.

Epimeria puncticulata, Brnrd. (Fig. 104 *d*).

Barnard, 1930, p. 376, fig. 42.

Occurrence: 1. St. 45. South Georgia. 1 ♀ 13 mm.
2. St. 123. South Georgia. 3 ♀♀ 11–13 mm.
3. St. 140. South Georgia. 8 ♀♀ 10–13 mm.
4. St. 148. South Georgia. 1 ♂ 10·5 mm.
5. St. WS 33. South Georgia. 1 ♂ 7 mm.
6. St. MS 71. South Georgia. 1 juv. 5·5 mm.

REMARKS. The 7th peraeon segment ends in a short medio-dorsal point, the keels on pleon segments 1 and 2 end in slightly more prominent points, and the triangular projection on segment 4 is more sharply pointed than in the Terra Nova specimens. The hind margin of 2nd joint of peraeopod 5 is usually slightly indented distally, but the lobe has a small point at the postero-inferior corner.

The figure here given of the 2nd joint of peraeopod 3 shows the point of divergence of the outer and inner keels right at the base, the strong sinuous expansion of the outer keel, ending in a sharp point, into which the lateral longitudinal keel does not enter, and the feeble expansion of the inner keel, which ends below in a small subacute lobe. In a true external side-view the inner keel is scarcely visible below the concavity of the outer keel (cf. fig. 42, 1930). In peraeopod 4 the inner keel is completely concealed in external view, and an apical lobe is scarcely developed.

One inter-antennal tubercle.

The colour of no. 1 is given as follows: "Pale yellow. Each of first 7 segments with a transverse pale brown band dorsally along both anterior and posterior margins. Large side-plate of 4th segment largely red-brown. Posterior segments yellow mottled with brown. Caudal appendages and legs pale yellow. Eyes red".

DISTRIBUTION. McMurdo Sound, 92–175 m.

Epimeria acanthurus, Schell. (Figs. 104 *b*, 108, and Plate I, fig. 2).

Schellenberg, 1931, p. 162, fig. 85, and pl. i, fig. *g*.

Occurrence: 1. St. WS 81. Falklands. 1 ovig. ♀ 22 mm.
2. St. WS 85. Falklands. 1 ♀ 11·5 mm.
3. St. WS 86. Falklands. 1 ovig. ♀ 21 mm.

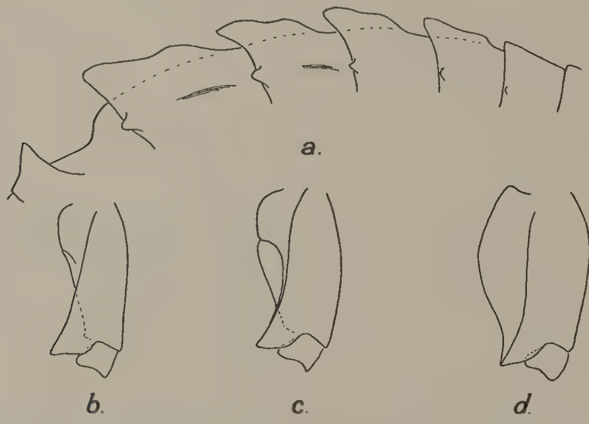

Fig. 108. *Epimeria acanthurus*, Schell. *a*. Dorsal profile of peraeon segments 6 and 7 and pleon segments 1–4. *b*, *c*, *d*. 2nd (and 3rd) joints of peraeopods 3–5.

DESCRIPTION. Like *puncticulata*, Brnrd., but peraeon segments 5 and 6 slightly keeled and ending posteriorly in a short point. Peraeon segment 7 and pleon segments 1–3 strongly keeled, the keels beginning near bases of segments, slightly indented in middle of dorsal profile, and ending in prominent subacute apices. Pleon segment 4 with sharp-pointed upstanding triangular process. A series of dorso-lateral tubercular processes on peraeon segment 7 to pleon segment 3, faint on peraeon segment 7 (sometimes also one on segment 6) and on pleon segments 2 and 3, consisting of a short ridge or keel near base of segment and a conical tubercle on hind margin.

Peraeopods 3 and 4, 2nd joint with the point of divergence of the outer and inner keels distal to the rounded basal lobe, inner keel not expanded, lateral longitudinal keel confluent in distal third with the outer keel and forming the subacute apex of the distal lobe, which does not quite extend to apex of 3rd joint. Peraeopod 5, 2nd joint similar to that of *puncticulata* but distal hind margin lobe ending in a subacute point, to which the lateral longitudinal keel runs out.

One inter-antennal tubercle.

REMARKS. There is very strong temptation to regard this form as a more strongly tuberculate variety of *puncticulata*, especially as a somewhat similar colour pattern is found in both. The differences in the dorsal armature, however, are considerable; *puncticulata* is much broader across the middle of the peraeon than *acanthurus*; and finally the structure of the 2nd joints of peraeopods 3 and 4 is decisive. Schellenberg (1931, p. 162) has proposed the genus *Metepimeria* for this species.

The distinctly striped coloration of no. 1 offers an interesting contrast with the blotched coloration of nos. 2 and 3. The type (no. 1) still exhibits the pairs of faint salmon bands on peraeon segment 1 to pleon segment 4; the pleon segments have an additional band right at the base; side-plates 4 and 5 show two bands, and side-plate 6 one band, being the direct continuation of those on the peraeon segments. Note WS 12 for St. WS 86 says: "Colour and markings...with a more universal distribution of red pigment...[than in Note WS 9, which is the coloured sketch here reproduced] i. Red pigment extends to posterior border of head. ii. Coxopodites of 2nd, 3rd and 4th thoracic legs are pigmented, of the 4th completely. iii. Terga of the 6th and 7th free thoracic segments and the coxopodites of their appendages are fully pigmented. iv. Terga of all abdominal segments completely pigmented. v. Basipodites of the last three peraeopods bear colour at base of their hinder margins".

Epimeria intermedia, Schell. (Figs. 104 *c*, 109).

Schellenberg, 1931, p. 161, fig. 84, and pl. i, fig. *f*.

Occurrence: 1. St. 39. South Georgia. 1 ♀ 15 mm.
2. St. 140. South Georgia. 2 ♀♀ 10 and 12 mm.
3. St. 142. South Georgia. 1 juv. 5·5 mm.

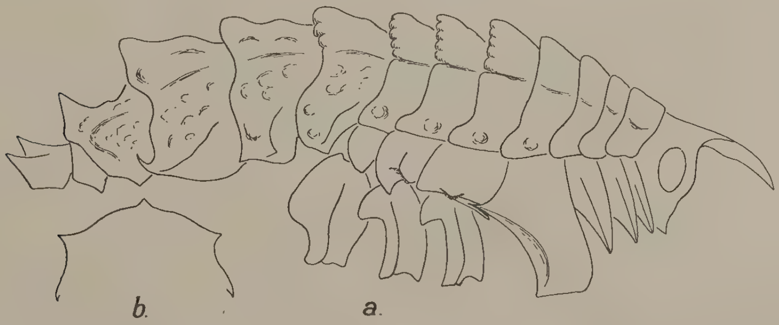

Fig. 109. *Epimeria intermedia*, Schell *a*. General view *b*. Cross-section of peraeon segment 2.

DESCRIPTION. Integument strongly punctate. Rostrum as long as rest of head or even a little longer (no. 2). Two inter-antennal tubercles Peraeon segments 1–7 dorsally carinate, the carinae becoming successively stronger and more imbricate posteriorly; dorso-lateral a slight ridge projecting horizontally and giving a very characteristic appearance; posterior margins of segments 5–7 faintly beaded between the dorso-lateral and medio-dorsal keels. Lower margins of segments feebly nodulose (obsolete in no. 1). Side-plate 4 deeper than long, antero-inferior angle rounded, postero-inferior angle quadrate; side-plates 5 and 6 nodose. Pleon segments 1–4 dorsally carinate, like the peraeon with a dorso-lateral ridge, and laterally somewhat irregularly and feebly nodulose; carina on segment 4 acutely triangular; segment 5 very short; segment 6 with a medio-dorsal upstanding triangular tooth, and the lateral margins produced backwards in acute lobes. Postero-inferior angle of pleon segment 3 produced in an acute upcurved hook; no angular projections on lateral margins above the postero-inferior angles.

Peraeopods 3 and 4, 2nd joints with an uncinate process on basal hind margin, beyond which the outer and inner keels diverge, the former expanded and ending in a slightly produced quadrate lobe, the latter scarcely expanded, lateral longitudinal keel running to the lower margin of lobe of outer keel. Peraeopod 5, 2nd joint with hind margin strongly expanded, the distal one-third semicircularly excised.

Uropod 2, outer ramus two-thirds length of inner.

REMARKS. The larger specimen, no. 1, is less nodose than the two smaller ones (no. 2) and but for the latter several of the less noticeable features would have been overlooked or ignored.

Genus **Epimeriella**, Wlkr.

Walker, 1907, p. 26.
Barnard, 1930, p. 377.

Epimeriella macronyx, Wlkr. (Plate I, fig. 3).

Walker, 1907, p. 26, pl. ix, fig. 15.
Schellenberg, 1926, p. 344.
Barnard, 1930, p. 378.

Occurrence: St. 162. South Orkneys. 1 ♂ 21 mm.

REMARKS. Side-plates 1–3 narrowly rounded or subacute below. The remarks on the Terra Nova specimens apply here also. Sixth joint of peraeopods 3 and 4 equal to the 2nd–4th joints together; dactyl two-thirds length of 6th joint. (The 6th joint is drawn a little too short in the coloured figure here reproduced.)

DISTRIBUTION. McMurdo Sound, 5–10 fathoms and 0–350 m.; 'Gauss' winter station, 385 m.

Epimeriella walkeri, Brnrd. (Fig. 110).

Barnard, 1930, p. 380, figs. 40 *c* and 44.

Occurrence: 1. St. 170. South Shetlands. 3 ♂♂ 11–13 mm., 25 ♀♀ 14–18 mm.
2. St. 182. Palmer Archipelago. 1 ♀ 17 mm.

REMARKS. None of the specimens are fully mature, but they agree with the original description except as regards gnathopods 1 and 2. The 6th joint has a distinct rounded palm as in the embryo figured in fig. 44 *c* (1930), and is finely pectinate as in *scabrosa*

(1930, fig. 43 *c*); the dactyl bears a series of slender spines separated by short spaces. The postero-inferior angles of the 2nd joints of peraeopods 3 and 4 are more rounded-quadrate, especially in peraeopod 3. There is one inter-antennal tubercle.

Specimen no. 2 has pleon segment 3 terminating in a more prominent blunt process, the posterior prominence on segment 4 is higher and symmetrically rounded, and the postero-inferior angles of the 2nd joints of peraeopods 3 and 4 are quite rounded; but in other respects it resembles the other specimens. This specimen is recorded as being "pure white with pink eyes".

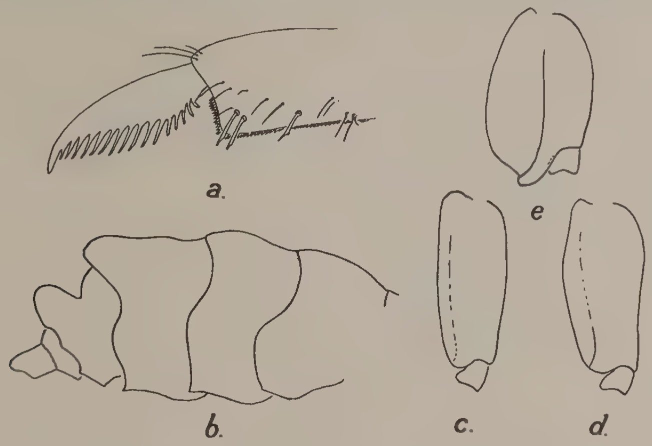

Fig. 110. *Epimeriella walkeri*, Brnrd. *a*. Gnathopod 1. *b*. Pleon segments 1–6. *c*, *d*, *e*. 2nd (and 3rd) joints of peraeopods 3–5. (*b–e* are from the specimen from St. 182.)

DISTRIBUTION. McMurdo Sound, 256–379 m.

Genus **Parepimeria**, Chevr.

Chevreux, 1913, p. 158.
Schellenberg, 1931, p. 164.

All the present specimens have a normal 4-jointed palp in the maxilliped, and the original generic definition must therefore be altered. The 4th joint is often difficult to see on account of the thick brush of setae on the 3rd joint.

Parepimeria crenulata, Chevr.

Chevreux, 1913, p. 158, figs. 47–49.

Typical form

Occurrence: 1. St. 42. South Georgia. 1 ♂ 7 mm., 10 ♀♀ 6–12 mm., 2 ovig. ♀♀ 10–11 mm.[1]
2. St. 123. South Georgia. 6 ♀♀ 8–12 mm.
3. St. 140. South Georgia. 3 ♂♂ 7–9·5 mm., 7 ♀♀ 8–11 mm.
4. St. 144. South Georgia. 1 ♂ 8 mm., 3 ♀♀ 8–10 mm., 1 juv. 5 mm.
5. St. 152. South Georgia. 1 ovig. ♀ 11 mm.
6. St. 175. South Shetlands. 1 ♀ 12 mm.
7. St. MS 63. South Georgia. 1 ♀ 9 mm., 1 ♀ with embryos 13 mm
8. St. MS 71. South Georgia. 1 ovig. ♀ 12 mm.

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[1] In all measurements of this species the rostrum is excluded.

Aberration

Occurrence: St. 170. South Shetlands. 1 ♂ 12 mm.

Remarks. The specimen from St. 170 found in conjunction with two specimens of the variety described below constitutes an interesting aberration; were it not for this aberrant specimen the new variety would have been accorded specific rank.

The rostrum is short, extending barely half-way along the 1st joint of the 1st antenna. Dorsal processes as in the typical form, except that pleon segment 3 has no tooth, only a rounded medio-dorsal keel, which is higher than in the variety. Lateral tubercles on peraeon segments obsolete.

Distribution. Palmer Archipelago, 129 m.

var. miothele, n.

Occurrence: 1. St. 170. South Shetlands. 2 mutilated ♀♀ (1 ovig.).
2. St. 195. South Shetlands. 2 ♂♂ 7·5 mm., 2 ovig. ♀♀ 9–10 mm., 1 juv. 5·5 mm. *Types*.

Description. Less spinose and tuberculate than the typical form. Head carinate, produced in a short rostrum extending half-way along 1st joint of antenna 1. Antero-lateral angle rounded-quadrate. Eyes large, circular, pale. Peraeon segments 1–4 smooth, dorsally rounded; segments 5–7 each with a pair of dorsal, adpressed, short processes, those on segment 5 apically subacute (in dorsal view), the others acute. No tubercles on lower margins of the segments. Side-plates 1–3 ovate, 1 narrowing to a subacute apex, somewhat curved forwards, 2 and 3 rounded below; 4 broadly rounded below. Pleon segments 1 and 2 each with a single medio-dorsal acute, decumbent process, not upstanding as in *crenulata*; segment 3 with a low rounded medio-dorsal keel. Postero-inferior margins of pleon segments 2 and 3 serrate as in *crenulata*. Telson as in *crenulata*.

Antennae, mouth-parts, and other appendages as in *crenulata*. The 2nd joints of gnathopods 1 and 2 have the same regular row of short spinules on the hind margins (on outer surface) as I find in the present examples of *crenulata*. Hind margins of 2nd joints of peraeopods 3–5 feebly serrate.

Parepimeria major, n.sp. (Fig. 111).

Occurrence: St. 177. South Shetlands. One specimen 17 mm.

Description. In general habitus like *crenulata* var. *miothele*. Head carinate, with short deflexed rostrum. Eyes broadly oval, quite white as preserved. A sinuous oblique ridge from upper hind margin of eye to middle of hind margin of head. Peraeon segments 1–4 rounded dorsally; 1 with a transverse groove, 2–4 each with the posterior margin gibbous; segments 5–7 each with a pair of long acute processes; no tubercles on lower margins of segments. Side-plate 1 acutely produced forwards; 2 and 3 ovate, subacute below; lower hind margin of 4 concave. Pleon segments 1 and 2 each with a strong projecting acute medio-dorsal tooth; segment 3 with a rounded keel posteriorly; postero-inferior angle of segment 1 quadrate, of 2 shortly pointed, of 3 quadrate with a short tooth; lateral margins of segments 1 and 2 slightly angular, of 3 with a small upturned tooth. Telson short, broad, apically rounded, dorsally concave, lateral margins raised, with a spine a little beyond the middle.

Antennae and mouth-parts as in *crenulata*. Palp of maxilliped with a strong spiniform 4th joint surrounded by the numerous setae of the 3rd joint.

Gnathopods 1 and 2 stouter than in *crenulata*, no regular row of spinules on hind margin of 2nd joint, but a few distally, 5th joint strong, broadly expanded, 6th also broader than in *crenulata*. Peraeopods 3–5, 2nd joint oblong, successively more expanded on hind margin proximally, hind margin very obscurely serrulate, a longitudinal keel from base to apex and an oblique one antero-proximally.

Remarks. Unlike the form described above as var. *miothele*, this form does not labour under the suspicion of being a variety of *crenulata*. The gnathopods are much stronger, and bear a remarkable resemblance to those of *Melphidippa macrura*. The specimen shows no sign of either penes or developing brood lamellae, and is thus immature. The adult must be considerably larger than *crenulata*.

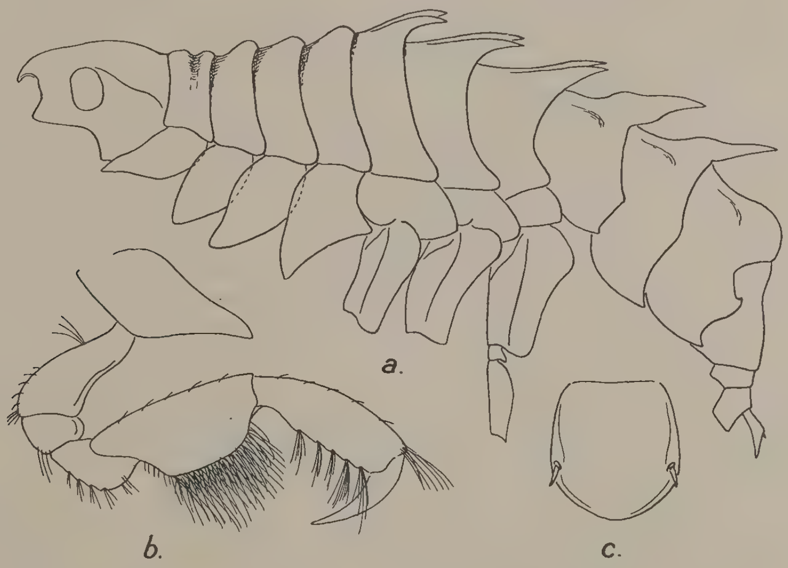

Fig. 111. *Parepimeria major*, n.sp. *a*. General view. *b*. Gnathopod 1. *c*. Telson.

Eclysis, n.g.

Body carinate. Rostrum short. Eyes absent. Side-plate 1 truncate or rounded below, 2 and 3 rather broader than in typical *Epimeria*, 4 not strongly produced behind and not fitting into a groove on 5. Epistome and upper lip prominent, gibbose. Mandible with a strongly dentate cutting edge, no secondary cutting plate in either mandible, and a thin tapering setose lamina in place of the grinding molar, as in *Epimeriella*. Maxillary palp large, 2nd joint laminate. Maxilliped with inner plate truncate, outer plate very large, palp relatively short.

Gnathopods 1 and 2, 5th joint triangular, distally widened, 6th with ill-defined palm. Peraeopod 5 longer than, or at least as long as, peraeopod 4. Telson apically incised or deeply notched.

Remarks. The diagnosis of *Epimeriopsis* (Barnard, 1931, p. 428) based on a specimen erroneously identified as *australis*, Chilton, together with the designation of this species as the genotype, constitutes a composite diagnosis, and the name is therefore void *ab initio*.

Eclysis similis, n.sp. (Fig. 112).

Occurrence: St. 123. South Georgia. 1 ♀ 12 mm.

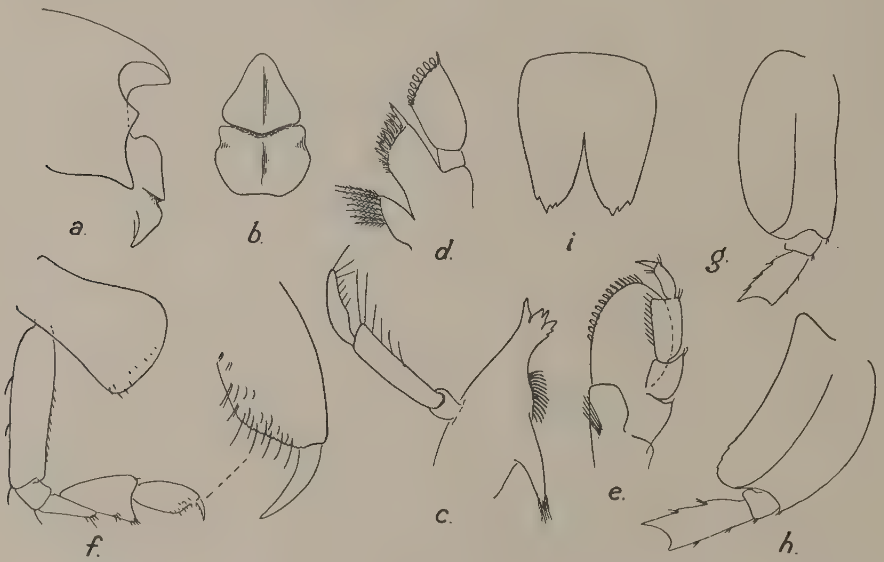

Fig. 112. *Eclysis similis*, n.g., n.sp. *a*. Head, with profile of epistome and upper lip. *b*. Frontal view of epistome and upper lip. *c*. Mandible. *d*. Maxilla 1. *e*. Maxilliped. *f*. Gnathopod 1, with palm further enlarged. *g*. Peraeopod 3. *h*. Peraeopod 5. *i*. Telson.

Description. Agreeing in general with Chilton's description and figure of *A. australis*, 1912, but with the following differences and additions.

Head with antero-inferior corner produced in a short subacute point. Side-plate 1 widening below, lower margin slightly convex, not straight as in Chilton's figure. Side-plate 5, postero-inferior angle rounded as in the 6th side-plate. Dorsal teeth not quite so high as in Chilton's figure; that on pleon segment 4 more evenly rounded and not so strongly lobed just above the notch. Telson apically incised, lobes subacute, with four denticles (asymmetrical).

Antenna 1, the teeth on 1st and 2nd joints are all short, not at all prominent, accessory flagellum absent. Epistome and upper lip gibbous, with a low median keel, separated by a groove; upper lip broader than long, apically rounded-truncate.

Mandible, cutting edge divided into three teeth, bifid or with accessory denticles, separated by deep incisions, no secondary cutting plate in either mandible, spine row well developed, molar a thin tapering setose lamina, palp strong, 3rd joint abruptly narrower than distal end of 2nd. Lower lip, inner lobes absent, outer lobes as in *Epimeria cornigera*. Maxilla 1 as in *cornigera*, but palp stronger, 2nd joint ovate-oblong, with eight clavate spines, and a slender spinule at each end on distal margin. Maxilla 2 as in *cornigera*. Maxilliped, inner plate short, apically truncate, with a few setules, outer plate very large, lamellate, inner margin with clavate spines which pass gradually into slender spines distally, 2nd joint of palp with straight inner margin and quadrate inner apical angle.

Gnathopods 1 and 2, 2nd joint with some fine setules on anterior margin and a few longer setae on hind margin, 5th joint triangular, distally widened, 6th much narrower than distal width of 5th and slightly shorter, palm oblique, ill-defined, except by very fine pectination, dactyl with setules on inner margin.

Peraeopods 3 and 4, 2nd joint evenly oval. Peraeopod 5, 2nd joint oblong, anterior margin convex, hind margin slightly concave between the upper narrowly rounded angle and the lower, more broadly rounded angle which is obscurely serrulate.

Uropods somewhat mutilated but corresponding with Chilton's description. Peduncle of uropod 3 keeled on both outer and inner upper margins, each keel ending behind in a short acute tooth.

REMARKS. This specimen was at first thought to be a small example of *A. australis*, Chilton, 1912. A specimen of what is undoubtedly the true *australis*, however, has been studied by Schellenberg, who finds that it is an Iphimediid, and for it has instituted the genus *Iphimediopsis* (1931, pp. 126, 127, pl. i, fig. *c*).

The dorsal armature, except for a very slight difference in the shape of the hinder part of the keel on pleon segment 4 is the same in both species; and in other respects there is great similarity. The main differences as noted above are the shapes of the 5th joints of the gnathopods, and the 2nd joints of peraeopods 3–5, and the telson. Chilton figures the hind margin of the 2nd joint of the gnathopods as markedly spinose, and the 5th joint as cylindrical; his description of the telson as "...emarginate posteriorly" scarcely fits the present specimen. The palp of the maxilliped appears to be longer; the figure here given is drawn from the mounted flattened preparation.

It should be remembered that the Scotia specimen of *australis* was 35 mm. in length and Schellenberg's ovig. ♀ 45 mm., whereas the present one is much smaller. It is preparing for ecdysis, as the new skin can be seen within the old in the mandibles and other parts. The brood lamellae are well developed though without marginal setae.

Family ATYLIDAE

Stebbing, 1906, p. 327.

Genus **Nototropis**, Costa.

Stebbing, 1906, pp. 329, 728.
Schellenberg, 1925, p. 148; 1931, p. 167.
Barnard, 1930, p. 382.

Nototropis villosus (Bate) (Fig. 113).

Bate, 1862, p. 135, pl. xxvi, fig. 1.
Stebbing, 1906, p. 334 (*species obscura*).

Typical form

Occurrence: St. WS 89. Tierra del Fuego. 1 ♀ 19 mm.

DESCRIPTION. Rostrum extending to half length of 1st joint of antenna 1. Head dorsally carinate, antero-lateral angle rounded, post-antennal angle rounded-quadrate. Eyes oval dark. Peraeon segments 1–7 all carinate, but not posteriorly toothed. Side-plates 1–4 deep, oblong, 1 and 2 rounded below, margin serrulate and spinulose, 3 and 4 subquadrangular below, lower margin of 4 slightly concave, antero- and postero-inferior angles serrulate and spinulose. Side-plates 5–7 shallow, anterior lobe of 5 and 6 very small, anterior and posterior corners serrulate and spinulose. Pleon segments 1–5 + 6 carinate, the carina produced to a tooth only on segment 4, which has the usual little notch. Postero-inferior angles of segments 1–3 quadrate, each with an oblique keel running out to the short acute point, lower margin of segment 1 setose, of segments 2 and 3 spinulose, the spinules set in little groups of 2–3 just within the margin. Telson, lobes tapering to subacute apices, each with a spinule in the apical notch.

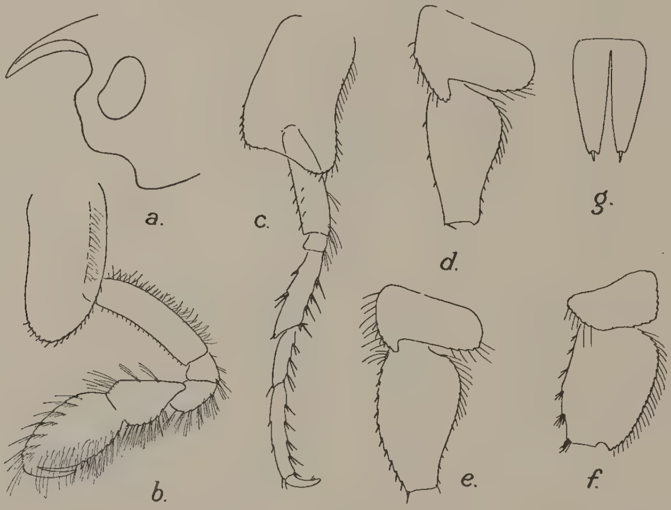

Fig. 113. *Nototropis villosus* (Bate). *a*. Head. *b*. Gnathopod 1. *c*. Peraeopod 2. *d*. Peraeopod 3. *e*. Peraeopod 4. *f*. Peraeopod 5. *g*. Telson.

Antenna 1, 2nd joint longer than 1st, 3rd considerably shorter, flagellum 31–32-jointed, peduncle and flagellum with setae on lower margin. Antenna 2 about as long as antenna 1, 4th joint slightly longer than 5th, flagellum about 20-jointed, peduncle and flagellum setose, but not densely. The villose pads described by Bate in the ♂ are absent in ♀.

Mouth-parts normal. Mandibular palp with 2nd and 3rd joints subequal.

Gnathopod 1, 2nd joint setulose on front margin, setose on hind margin, 5th triangular, 6th ovate, longer than 5th, palm oblique, not defined except by two spines, front margin with transverse rows of setae, lower margins of 4th–6th joints strongly setose. Gnathopod 2 resembling gnathopod 1, but more slender.

Peraeopods 1 and 2, 2nd joint linear, 6th longer than 4th and nearly equal to 2nd. Peraeopod 3, 2nd joint basally expanded, tapering distally, hind margin serrulate and setose basally, concave distally with a few setules. Peraeopod 4 similar to peraeopod 3, but longer, 2nd joint similar but anterior margin more convex and rather strongly spinulose. Peraeopod 5 slightly longer than 4th, 2nd joint ovate, hind margin convex and serrulate throughout. Dactyls of peraeopods 3–5 pointing forwards.

Uropod 1, upper margin of peduncle spinulose, rami subequal to peduncle. Uropod 2 shorter than uropod 1, peduncle shorter than that of uropod 1, outer ramus defective on both sides. Uropod 3 extending as far back as uropod 1, peduncle short, half the length of that of uropod 2, both rami narrow, tapering, subequal, with spinules on both margins, and in addition plumose setae on inner margins.

Branchial lamellae simple, with slight indications of pleating near bases.

Dentate form

Occurrence: St. 222. Cape Horn. 1 ♂ 15 mm., 2 ♀♀ 15–16 mm.

Description. This form does not differ from the typical form except in having the dorsal carina produced in pointed teeth on pleon segments 1–3 and 6, as well as on pleon segment 4; all the peraeopods shorter and stouter; and the branchiae slightly more pleated basally.

Remarks. This is a very interesting rediscovery of a species described from a single ♂, and apparently not since observed. Bate's description proves to be good and his figure shows moderately well the features which distinguish this species.

It will be noted that the shape of side-plates 4–6, especially of the dentate form, bring this species near to *smitti* (cf. Sars, 1895, pl. clxv, fig. 1), from which it is distinguished by the anterior margin of head, 2nd joint of peraeopod 5, and the telson.

The lower margins of pleon segments 1–3 in these specimens are not actually serrate as Bate describes them, but the submarginal groups of spinules produce the same appearance (under a low magnification) as is shown in Bate's figure.

The variable development of the dorsal teeth and of the pleating on the branchiae indicates that a revision of the northern species might result in the reduction of species.

Distribution. Hermite Island.

Family LEPECHINELLIDAE

Schellenberg, 1926, p. 344.

Genus Lepechinella, Stebb.

Stebbing, 1908 (*Journ. Linn. Soc. Lond.*, xxx), p. 191.
Chevreux, 1914 (*Bull. Inst. océan. Monaco*, no. 296), p. 1 (*Dorbanella*).
Schellenberg, 1925 (*Mitt. Zool. Mus. Berlin*, xi), p. 205 (*Dorbanella*).
Barnard, 1925, p. 355.
Schellenberg, 1926, p. 344.

In February 1925 Schellenberg instituted the family Dorbanellidae for this genus, placing it in the neighbourhood of the Atylidae. The priority of Stebbing's name was independently pointed out in December 1925 (Barnard) and in 1926 Schellenberg changed the family name in conformity.

The affinity to the Atylidae is shown in the fused 5th and 6th pleon segments. This point escaped Stebbing's notice; he figures a well-marked suture between the two segments. I have re-examined the Cape specimens and find, both in them as well as in the Antarctic specimen described below, that while the line of junction between the two segments is quite well marked, especially at the sides, the 6th segment is immovably united with the 5th.

The juxtaposition of this family and the Atylidae thus seems well established. A further likeness is found in the pleated branchiae, which are often found in *Nototropis*, though in *Atylus* itself they are simple. The presence of well-developed inner lobes in the lower lip is, however, in conflict with the characters of the Atylidae.

Three species of this genus are known: *chrysotheras*, Stebb., from off the Orkney Islands and off the Cape of Good Hope [Schellenberg's *Dorbanella* sp. (1925) from the Arctic Sea seems to be this species]; *echinata*, Chevr., from the Bay of Biscay; and *drygalskii*, Schell., from the 'Gauss' winter station in the Antarctic. A fourth species is described below.

Lepechinella cetrata, n.sp. (Fig. 114).

Occurrence: St. 170. South Shetlands. 1 ♂ 9 mm.

Description. Head with two spines on anterior margin (between bases of the antennae), antero-inferior angle produced in a short sharp point. No trace of eyes. Peraeon and pleon carinate. The carinae on the peraeon segments not produced into teeth, though that on segment 7 approximates to the dentate form; on the anterior segments the profile shows merely rounded humps, two on segment 1 and one on each of the following segments. Segment 1 with the antero-inferior corner produced in a short tooth; segment 2 somewhat rounded below. Side-plate 1 slipper-shaped, strongly produced forwards, lower margin serrate, anterior and lower margins setose, side-plate 2 oblong, lower margin slightly indented, hind angle with 1–2 serrations and setae; 3 oblong, lower margin angularly indented; 4 similar but shorter and not so deeply indented; 5 and 6 with narrow pointed anterior lobes. Pleon segments 1–3 with the dorsal carina raised into a tooth posteriorly; segment 4 with an upstanding tooth; segment 6 with a small median tooth at base of telson, and a smaller lateral one at base of uropod 3; segments 5 and 6 united, but with the suture visible, at least laterally, and marked by a line of setules. Postero-inferior angle of segment 1 quadrate, of 2 and 3 produced in a short point. Telson cleft nearly to base, lateral margins straight, acute apex of each lobe bearing a stout spine or seta (broken, length therefore uncertain).

Antennae without particular features, similar to those of *chrysotheras*, the accessory flagellum very minute; none of the flagella preserved intact. Mouth-parts in general as in the other species; armature of outer plate of maxilliped as in *drygalskii*, inner lobes of lower lip well developed.

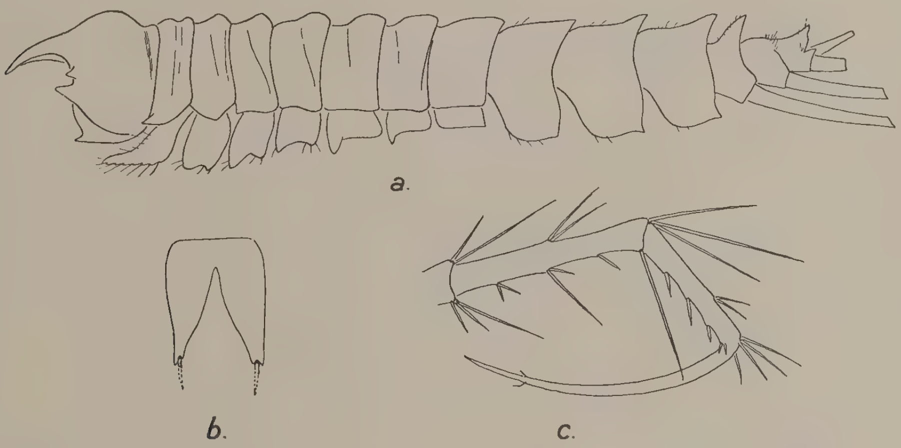

Fig. 114. *Lepechinella cetrata*, n.sp. *a*. General view. *b*. Telson (spines broken). *c*. 5th–7th joints of peraeopod 1.

Gnathopod 1 very similar to that of *drygalskii*, the 5th joint being distally more expanded and the 6th joint more ovate than in *chrysotheras*. Gnathopod 2 similar to that of *chrysotheras*. Peraeopods 1 and 2 are remarkable for the elongate dactyls, which equal the 2nd joint in length; and the 4th–6th joints have even longer spines than in *chrysotheras*. Peraeopods 3–5, 4th–6th joints also with long spines, but the dactyls do not exceed the 6th joint in length.

Uropods as in *chrysotheras*, but more spinose.

Branchiae strongly pleated basally.

Remarks. Easily distinguished by the lack of spinous projections in comparison with the other species, which are heavily armed; a character to which the specific name refers. Other points of note are the deeply cleft telson and the very long dactyls of peraeopods 1 and 2. The side-plates are not very different from those of *drygalskii*.

Family MELPHIDIPPIDAE

Stebbing, 1906, pp. 334, 728.

Genus **Melphidippa**, Boeck.

Stebbing, 1906, p. 335.
Schellenberg, 1926, p. 347.

Melphidippa antarctica, Schell.

Walker, 1907, p. 34 (*macrura*, *non* Sars).
Schellenberg, 1926, p. 347; 1931, p. 170, fig. 89.
Barnard, 1930, p. 383.

Occurrence: 1. St. 42. South Georgia. 3 ♀♀ 9–10 mm.
2. St. 45. South Georgia. Three mutilated specimens 10–14 mm.
3. St. 123. South Georgia. 2 ♀♀ 12 and 15 mm., 12 immat. 7–11 mm.
4. St. 140. South Georgia. 11 immat. and mutilated, up to 12 mm.
5. St. 148. South Georgia. 1 ♂ 8 mm.
6. St. 149. South Georgia. 1 ovig. ♀ 14 mm., 1 immat. 11 mm., 1 juv. 8 mm.
7. St. 152. South Georgia. 1 ♀ 12 mm.
8. St. 175. South Shetlands. 2 ♀♀ 18–19 mm.

Remarks. Unlike the Terra Nova specimen, the medio-dorsal tooth on pleon segment 1 is distinctly larger than any of the other denticles on that segment; those on segments 2, 3 and 4 increasing in size, that on segment 5 being rather smaller and more slender than that on segment 4. In other respects agreeing with the Terra Nova specimen.

Although there seems to be considerable variation in the dorsal denticles, the shape of the 5th and 6th joints of gnathopods 1 and 2 precludes this species from being confused with *serrata* from Kerguelen.

Distribution. McMurdo Sound, 300 fathoms, and 10 m.; 'Gauss' winter station, 385 m.

Family EUSIRIDAE

Stebbing, 1906, pp. 338, 728.

Genus **Eusirus**, Kröy

Stebbing, 1906, pp. 338, 729.
Chilton, 1912, p. 489.

Eusirus antarcticus, Thoms.

Stebbing, 1906, p. 340.
Walker, 1907, p. 30 (*propinquus*, *non* Sars).
Chevreux, 1911, p. 405, fig. 3 (*bouvieri*).
Chilton, 1912, p. 490.
Schellenberg, 1926, p. 348; 1931, p. 171.
Barnard, 1930, p. 384, fig. 46 *a*, *b*.
? Chevreux, 1906, p. 49, figs. 27–30 (*laticarpus*).

Occurrence: 1. St. 27. South Georgia. 1 ♀ 15 mm.
2. St. 123. South Georgia. 5 ♀♀ 11–12 mm.
3. St. 140. South Georgia. 1 ♂ 12 mm., 3 ♀♀ 11–12 mm.
4. St. 144. South Georgia. 2 ♀♀ 11 and 18 mm.
5. St. 149. South Georgia. 3 ♀♀ about 13 mm. (mutilated).
6. St. 167. South Orkneys. 1 ♀ about 15 mm. (head missing).
7. St. 175. South Shetlands. 1 ♀ 24 mm.
8. St. 181. Palmer Archipelago. 1 ♂ 19 mm., 1 ovig. ♀ 24 mm.
9. St. 182. Palmer Archipelago. 1 ♀ 19 mm.
10. St. 195. South Shetlands. 4 ♀♀ 15–29 mm.
11. St. WS 88. South America. 1 ♂ 10 mm.

REMARKS. The eye, as preserved, is brown, surrounded by a paler ring.

In the above material, nos. 1–7 and 11, i.e. those from South Georgia, South Orkneys, point of South America and Bransfield Strait (59° W), have only pleon segments 1 and 2 dentate; nos. 8–10, i.e. those from the Palmer Archipelago and Bransfield Strait (58° W), have peraeon segment 7, and sometimes also segment 6, dentate as well as pleon segments 1–3 (no. 10 has no tooth on segment 3). Thus there seems to be some evidence of a more easterly bidentate race, and a more westerly quadridentate (sometimes tri-, sometimes quinque-dentate) race. Nos. 7 and 10, however, overlap; and the evidence for geographical races is cancelled if we include the bidentate *laticarpus* from the still more westerly region of Marguerite Bay in the synonymy of *antarcticus*.

With more abundant material, the doubt expressed in the Terra Nova Report (1930, p. 385) as to the synonymy of *laticarpus* may prove justified. It may be noted also that two of Chevreux's records (1913, p. 167) of this species are from sponges and may thus indicate that this is more of a bottom dweller than the other species seem to be.

DISTRIBUTION. Sub-antarctic and Antarctic regions.

Eusirus perdentatus, Chevr. (Fig. 115).

Chilton, 1912, p. 492, pl. ii, fig. 20 (*splendidus*).
Chevreux, 1913, p. 163, figs. 50–52.
Barnard, 1930, p. 386, fig. 46 *c* (references).

Occurrence: 1. St. 167. South Orkneys. Many ♂♂ up to 40 mm., ♀♀ up to 52 mm.
2. St. 170. South Shetlands. 2 ♂♂ 38, 40 mm.
3. St. 180. Palmer Archipelago (160 m.). 1 ♂ 38 mm.
4. St. 181. Palmer Archipelago. 1 ♂, 1 ♀ both 47 mm.
5. St. 186. Palmer Archipelago. 1 ♀ 40 mm.
6. St. 190. Palmer Archipelago (90–130 m.). 3 immat. ♂♂ 26–28 mm., 2 immat. ♀♀ 25–26 mm.
7. St. 190. Palmer Archipelago (315 m.). 1 immat. ♂ 26 mm.
8. St. 195. South Shetlands. 1 ovig. ♀ 50 mm.

REMARKS. As preserved the eye is dark brown, surrounded by a paler ring.

There is only one actually ovigerous ♀; the largest ♀♀ from St. 167 have the brood pouches fully developed and extended but empty, and are thus either spent or have lost their eggs during capture and preservation. The dates of these captures were in February and March. The Terra Nova fully-developed ♀♀ were caught in January and February.

Colour notes made from fresh specimens are as follows: Note 127 for St. 170: "Ground colour of thorax and body ochraceous buff, darkest dorsally and palest laterally, with conspicuous red blotches and mottling. Between the eyes 4 red spots, 2 median and 1 pair lateral. Second and third [*sic* = 1st and 2nd] thoracic segments wholly red. Fourth to eighth [*sic* = 3rd–7th] segments faintly mottled with red, but with more conspicuous mottling on the coxal plates. First 3 abdominal segments blotched with red, with a specially dark patch mid-laterally on 1st and 2nd segments. Remaining abdominal segments and telson marked with red dorsally. Antennules suffused with red; antennae blotched with crimson. Mouth-parts and both gnathopods deep crimson, with a suffusion of the same colour on the coxal plates. The 5 thoracic legs milk-white, the first 2 red at the tips, the remainder heavily blotched with red. First 3 pleopods white, the remainder and uropods [*sic* = uropods 1–3] suffused with red. Eyes grey black". Note 146 for St. 190 (no. 6): "Creamy buff, mottled and marbled with bright scarlet. Thoracic legs with scarlet bands. Eyes dark brown".

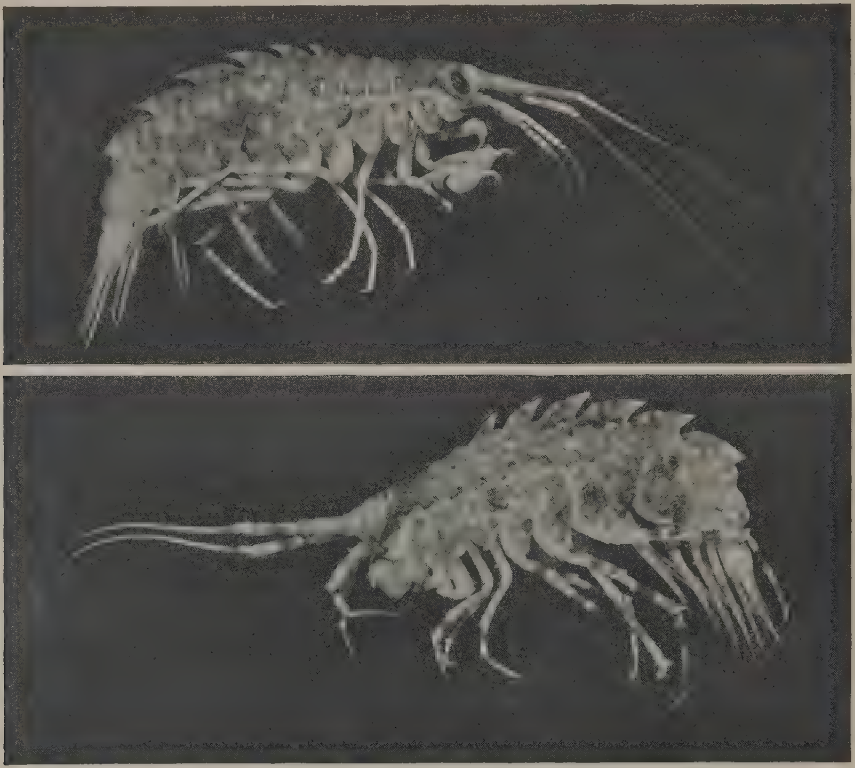

Fig. 115. *Eusirus perdentatus*, Chevr. Photographs taken on board (Notes 127 and 146).

DISTRIBUTION. Palmer Archipelago, 60–70 m.; South Orkneys, 54 fathoms; 'Gauss' winter station, 385 m.; Ross Sea and McMurdo Sound, 329–547 m.

Eusirus microps, Wlkr.

Walker, 1907, p. 31, pl. xi, fig. 19.
Barnard, 1930, p. 385, fig. 47 (references).

Occurrence: 1. St. 116. Bouvet Island. 1 juv. 8·5 mm.
2. St. 202. South Shetlands. 1 ♀ 34 mm.

REMARKS. The eyes as preserved are black. The juvenile from St. 116 is interesting. Small as it is, there is no doubt that it belongs to this species. The eye is subcircular and the side-plates are characteristically shallow. The hands in both gnathopods are oval, though the anterior margin is slightly shorter than the anterior margin of the 5th joint. Only pleon segments 1 and 2 are dentate.

In contrast to both the preceding species, this species seems to inhabit the upper layers, though maybe it ascends at night time, as both the present captures were made at night. From previous records it would seem to be a frequent food of penguins.

DISTRIBUTION. McMurdo Sound; Petermann Island; 'Gauss' winter station.

Genus **Eusiroides**, Stebb.

Stebbing, 1906, pp. 345, 729; 1910, p. 594.
Pirlot, 1929 *a*, p. 10.
Schellenberg, 1929 *a*, p. 282.

For further reasons against Chilton's suggestion of sinking this genus in *Bovallia*, see under the latter genus (p. 196). One may refer here to the importance of examining the integumentary sculpture. The present specimens, and the South African ones referred to *monoculoides* (Barnard, 1916, p. 174), exhibit a type of sculpture entirely different from that of *Bovallia*.

Eusiroides georgianus, n.sp. (Fig. 116).

Occurrence: 1. St. 141. South Georgia. 1 ovig. ♀ 15 mm.
2. St. 159. South Georgia. 1 ovig. ♀ 16 mm.
3. St. 170. South Shetlands. 3 ♀♀ (2 ovig. 1 with embryos) 16–17 mm.
4. St. 175. South Shetlands. 1 ♀ 16 mm.
5. St. WS 25. South Georgia. 2 ♀♀ 16 and 20 mm., 1 ovig. ♀ 20 mm.
6. St. MS 25. South Georgia. 1 ♂ 15 mm., 1 ovig. ♀ 18 mm. *Types*.
7. St. MS 71. South Georgia. 1 ♀ 20 mm.

DESCRIPTION. Agreeing in almost every particular with Stebbing's original description and figures of *crassi*. Whole peraeon and pleon dorsally rounded, without any suggestions of teeth. Postero-inferior angle of pleon segment 3 rather more produced than in Stebbing's figure, rounded, but with a tiny tooth and a *rounded sinus*. Side-plate 1 strongly widened below and produced forwards.

Gnathopods 1 and 2, 6th joint more ovate, palm more oblique and longer than in Stebbing's figures of *crassi*, thus approximating to those of *caesaris*; the palmar spines also like those of the latter species, not so stout as in *crassi*.

Maxilla 1, 3–4 setae on inner lobe. Maxilla 2, inner lobe broader than outer, without any submarginal oblique row of setae.

Telson twice as long as basal width, cleft for just over half its length, the lobes tapering evenly to acute entire apices, one or two long upstanding simple setae on lateral margin at about two-thirds or three-quarters the length (absent in no. 5). Under a high magnification the surface appears covered with very fine transverse lines. In the embryo from the brood-pouch the telson resembles that of the adult in shape and extent of the cleft.

Integument very minutely shagreened, with scattered pits; under a high magnification by transmitted light very fine more or less parallel lines are visible as in the enlarged portion of the telson figured here.

Eyes reniform, nearly contiguous dorsally.

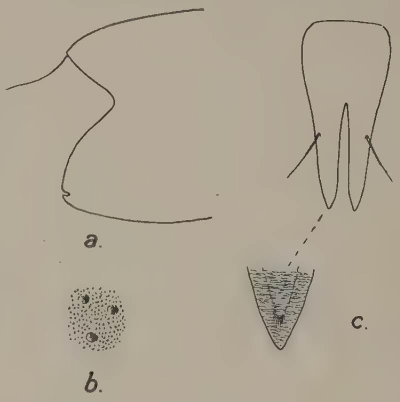

Fig. 116. *Eusiroides georgianus*, n.sp. *a*. Pleon segment 3. *b*. Portion of integument highly magnified. *c*. Telson, with apex of one lobe highly magnified to show sculpture.

Remarks. It would be easy to regard this form as a variety of *crassi*, which was taken farther north off Monte Video in 600 fathoms; or perhaps to regard the combination of a pleon segment 3 with only one notch, together with the palm of gnathopods as in *crassi*, as an argument for uniting the "triumvirate" *caesaris*, *pompeii* and *crassi*. Between a sinus and a serration there would seem to be but little difference; yet there is a difference and it would not be quite correct terminologically to describe the sinus of pleon segment 3 in the present specimens as a single serration (cf. the figure here given with Stebbing's figure of the pleon segment 3 in *caesaris* or *pompeii*, 1888, pls. lxxxviii, lxxxix). Typical *crassi* has no suggestion of either a sinus or a serration (cf. Stebbing, 1888, pl. xc). The telson is much more deeply cleft than in typical *crassi*.

In the above comparison I have referred throughout to typical *crassi*, i.e. the Challenger specimen from off Monte Video. This is necessary because Stebbing himself has recorded *crassi* from South-east Australia and expressed doubt as to whether *crassi* can be maintained as a species distinct from *monoculoides*. The presence of two serrations on pleon segment 3 in the Australian specimen seems to imply that it should have been referred to *monoculoides*. I do not consider the Australian "*crassi*" to be synonymous with the true Atlantic *crassi*. Whether *georgianus* will prove to be really distinct from *crassi* is a different matter.

Eusiroides stenopleura, n.sp. (Fig. 117 and Pl. I, fig. 4).

Occurrence: 1. St. 71. South-west Atlantic. 1 ♂ 15 mm., 1 juv. 13 mm.
2. St. 114. Bouvet Island. 1 ovig. ♀ 24 mm.
3. St. 239. South-west Atlantic. 2 ♀♀ 19 and 25 mm. *Types*.

DESCRIPTION. Close to *crassi*, Stebb. All side-plates considerably shallower than their segments; 1–4 longer than deep; 1 subquadrangular, not projecting below inferior margin of head, scarcely produced forwards, but antero-inferior angle quadrate. All peraeon segments rounded dorsally. Postero-inferior angle of pleon segment 3 quadrate, margin entire. Telson cleft for a little more than half its length, apices acute.

Antenna 1, accessory flagellum obsolete. Lower margin of flagellum of antenna 1, and upper margin of flagellum and 5th peduncular joint of antenna 2 calceoliferous. Mandible with 2nd palpal joint very broad.

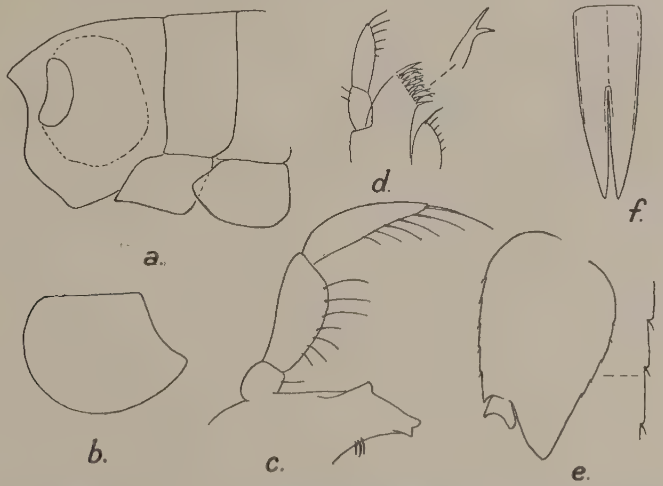

Fig. 117. *Eusiroides stenopleura*, n.sp. *a*. Head, peraeon segments 1 and 2, with side-plates; the dotted line indicates the extent of the reddish pigment. *b*. Side-plate 4. *c*. Mandible. *d*. Maxilla 1, with spine from outer lobe further enlarged. *e*. 2nd joint of peraeopod 5 with hind margin further enlarged. *f*. Telson.

Gnathopods 1 and 2, palm of hand evenly convex as in *crassi*, defined by one spine proximally. Peraeopods 3–5, 2nd joint with hind margin entire, or, in peraeopod 5, very feebly indented.

Otherwise resembling *crassi*.

REMARKS. These specimens certainly represent a distinct species; the shallow side-plates separate it from all the others.

The faceted eyes are reniform and, as preserved, reddish; but lying within the cuticle and occupying nearly the whole of the side of the head is a round patch of reddish pigment, dorsally almost contiguous with its fellow. Compare Strauss' figures of the form he calls *Rhachotropis diploöps*, n.sp., captured by the 'Valdivia' at St. 54 in the Atlantic (1° 51′ N, 0° 31′ E). Strauss (1909, p. 38, pl. iv, figs. 24, 25) gives no description, except of the eye, by which the species can be identified and Schellenberg (1926 *b*) makes no mention of it. Strauss' fig. 24 would fit the present specimens as regards the rostrum (for this reason his specimen was certainly not a *Rhachotropis*), the mandibular palp, and the antennae, but not the 1st side-plate. The anterior margin of the latter is just indicated by Strauss and shows a rounded antero-inferior angle projecting considerably below the inferior margin of head. This is possibly not to be taken too seriously, as Strauss was concerned with the eye-structure only, and, as mentioned elsewhere, was not a systematist. Nevertheless, in spite of the evident similarity in the eye-structure, I do not think the present specimens should be identified with "*Rhachotropis diploöps*", which remains in any case a *nomen nudum*.

Genus **Eusirella**, Chevr.

Chevreux, 1908 (*Bull. Inst. océan. Monaco*, no. 121), p. 12.
Schellenberg, 1926 *b*, p. 228.

Eusirella elegans, Chevr.

Chevreux, 1908 (*loc. cit.*), p. 12, figs. 7, 8.
Schellenberg, 1926 *b*, p. 228, fig. 19 (*valdiviae*).

Occurrence: St. 87. South-east Atlantic. 1 ♂ 8·5 mm.

REMARKS. This specimen shows that both the Princess Alice and the Valdivia specimens were but immature forms of the same species, the former possibly ♀, the latter probably ♂.

No trace of eyes. Telson with the lobes only distally dehiscent, apices acute, each with a very minute notch and setule (only seen under high magnification).

Antenna 1, 1st peduncular joint with a small point on upper apex and a strong tooth bearing two setae on lower apex; this tooth in lateral view is acute, but in ventral view is chisel-shaped; 2nd joint with an apical point above, and two setae below, densely calceoliferous on lower and inner surfaces, flagellum 18-jointed, calceoliferous, accessory flagellum not visible. Antenna 2, 4th joint on upper and inner surfaces, and 5th joint on upper, lower, and inner surfaces densely calceoliferous, flagellum plump, 8-jointed, calceoliferous.

Gnathopods 1 and 2, palm with a row of spines and defined by two to three spines.

Uropods, rami sparsely spinulose, with the margins very minutely serrulate.

The locality of the 'Discovery' is close to that of the 'Valdivia'.

DISTRIBUTION. Azores, 38° N, 26° W, 0–2500 m.; South-east Atlantic, 31° 21′ S, 9° 46′ E, 3000–0 m.

Genus **Rhachotropis**, S. I. Smith.

Stebbing, 1906, p. 347.
Barnard, 1916, p. 178.

As mentioned above (p. 193) *Rhachotropis diploöps*, Strauss, 1909, besides being a *nomen nudum*, is not to be reckoned as belonging to this genus.

Rhachotropis antarctica, n.sp.

Occurrence: 1. St. 51. Falklands. 3 ♂♂ 7–10 mm., 6 ♀♀ (2 ovig. 1 with embryos) 7–9 mm.
2. St. 144. South Georgia. 11 ♀♀ (1 ovig. with embryos) 11–13 mm., 2 immat. 8 mm.
3. St. 167. South Orkneys. 2 ♂♂ 10–11 mm., 5 ♀♀ 13–14 mm., 2 immat. ♀♀ 9 and 11 mm. *Types*.
4. St. 170. South Shetlands. Fourteen specimens, mostly mutilated, incl. ovig. ♀♀, 14–20 mm.

5. St. 175. South Shetlands. 1 ♂ 18 mm., 19 ♀♀ 16–18 mm., 1 ovig. ♀ 20 mm. Four mutilated specimens.
6. St. 181. Palmer Archipelago. 10 ♀♀ 12–20 mm.
7. St. 182. Palmer Archipelago. 1 ♀ 16 mm.
8. St. 187. Palmer Archipelago. 1 ♂ 11 mm., 1 ovig. ♀ 15 mm.
9. St. 190. Palmer Archipelago (315 m.). 2 ♂♂ 17 mm., 1 ♀ 15 mm. (somewhat mutilated).

DESCRIPTION. Close to *inflata* (Sars) but: pleon segments 1–4 tricarinate, all the carinae produced into small acute teeth except the medio-dorsal one on segment 3, and the dorso-lateral ones on segment 4; and telson cleft for not more than, or scarcely more than (St. 51), one-third its length.

REMARKS. The much larger size and the fact that pleon segment 4 is tricarinate as well as the preceding three segments distinguishes this species from its northern counterpart *inflata*. From *rostrata* (Bonn.) it differs in having dorso-lateral keels on pleon segment 1 as well as on the three following segments, and well-developed eyes.

The smaller specimens from St. 51 do not appear to differ in any way from the others except in the slightly deeper telsonic cleft.

Family PONTOGENEIIDAE

Stebbing, 1906, pp. 356, 729.
Schellenberg, 1929 *a*, p. 273 (revision, with key to genera).

The representatives of this family have hitherto been involved in considerable confusion, and we have to thank Schellenberg for a most useful revision with sharp delimitations of the various genera. But, needless to add, many of the earlier species are still obscure, and only an examination of material collected in the original localities, and a re-examination of the material collected by previous expeditions, will extricate and stabilise the synonymy.

Chilton, relying apparently too implicitly on the assumption of "widely distributed species", did much to confuse our knowledge of the distribution of the species of this family by erroneous identifications. It is greatly to be regretted that, e.g., the Scotia material must be entirely re-examined before the localities there recorded can be available for working out the distribution of the species.

In suggesting the use of one character which has only been employed previously in a few cases, no generic value is claimed for it, though it would seem to have considerable specific value. This character is the surface sculpturing of the integument. From the figures here given for all the species contained in the Discovery collection, it will be seen that the differences are of no mean order and may well be used to separate species, or *per contra* as an indication of affinity.

It is in fact rather extraordinary that so little attention has been paid to the surface of the integument, apart from major features such as knobs, teeth, spinous processes and the like. The surface sculpture has been used to differentiate the species of *Hippomedon* (cf. Sars, 1895, pls. xx, xxi and Stephensen, 1923) and has been mentioned casually in a few instances in the present family, e.g. Stebbing, 1888, pl. lxxv. (*Paramoera australis*), Chilton, 1912, p. 500 (*Djerboa furcipes*), and Monod, 1926, fig. 54 (*Paramoera austrina*?). A few other examples could be added, as for instance Bate's description of the surface sculpture of *Halirages huxleyanus*.

The figures given by Stebbing and Monod are very useful, because apart from other characters they show conclusively that Stebbing's *australis* and Monod's *austrina* cannot possibly be united with *capensis*. Whether Monod's *austrina* is the same as *austrina* Bate must remain undecided until Bate's type, or material from the original locality, can be examined.

Although it necessitates the re-examination of much previous material, I think this is a character which should be adopted, not only in the present family, but throughout the Amphipoda and Crustacea generally. Every description of a species must be regarded as not fully complete which does not contain a mention of this "superficial" feature. The present writer fully admits his own deficiencies in this respect. This feature would have been mentioned throughout this report had not the present family, being a difficult one, been left until last, and the importance of the character not fully realized until the rest of the work had been completed.

I would suggest that difficult genera like *Orchomene*, *Orchomenella* and *Tryphosa* among the Lysianassidae be tested for this purpose. As regards technique, I need scarcely say that the integument must be carefully cleaned of all foreign matter adhering to it, and examined dry by reflected light; if not actually desiccated, there must at least be no free water or moisture on the surface.

Genus **Bovallia**, Pfr.

Pfeffer, 1888, p. 95.
Stebbing, 1906, p. 357.
Schellenberg, 1926, p. 354; 1929 *a*, p. 277.

In Schellenberg's revision this genus is now monotypic, the other species formerly included in it having been transferred as follows: *walkeri* (Stebb.) to *Paramoera*, *calliopioides*, Schell., to *Pontogeneia*, and *regis*, Stebb., to *Halirages*.

Bovallia gigantea, Pfr. (Fig. 118 *a*).

Pfeffer, 1888, p. 96, pl. i, figs. 2 and 5.
Chevreux, 1906, p. 54, figs. 31–33; 1913, p. 169.
Chilton, 1912, p. 494 (*monoculoides, non* Hasw.); 1925, p. 177 (*monoculoides, non* Hasw.).
Shoemaker, 1914, p. 74 (part, *monoculoides, non* Hasw.).

Occurrence: 1. St. 174. South Shetlands. 1 ♀ 40 mm.
2. St. 179. Palmer Archipelago. 1 ♀ 45 mm., 3 ♀♀ 20–24 mm., 2 juv. 10–11 mm.
3. St. WS 56. South Georgia. 5 ♂♂ 23–33 mm., 6 ♀♀ 24–40 mm., kelp roots.
4. St. MS 10. South Georgia. 1 immat. ♀ 28 mm.
5. East Cumberland Bay, South Georgia. 1 ♀ 39 mm.

REMARKS. The integument is covered with scattered circular punctae anteriorly, passing gradually into the elongate depressions which posteriorly are arranged in more or less transverse rows, producing an imbricate appearance.

Now that Schellenberg has pointed out the differential characters of the lower lip, 2nd maxillae, and 1st side-plate in *Bovallia* and *Eusiroides*, which characters were not utilized by Chilton, or even by Chevreux in his "seven points" (1913), both of Pfeffer's names are vindicated. Also we are no longer under the obligation, when recording "*Bovallia monoculoides*", of specifying whether we mean Haswell's form, or Pfeffer's form, or any of Stebbing's triumvirate. In fact, it is difficult to understand how the species of *Eusiroides* can ever have been confused with *Bovallia*. To Chevreux's seven points, Schellenberg has added three more; there is also the 4th side-plate, and if the character of the integument should prove to be similar in all the species of *Eusiroides* (cf. p. 191), twelve points of difference can be found.

Consequently all records of "*Bovallia monoculoides*" should be omitted from geographical considerations, until the specimens on which they were based have been re-examined. We may perhaps except Chilton's records (1912 and 1925) from the South Orkneys, as he specifically refers to the dorsal teeth and absence of serration on the postero-inferior margin of pleon segment 3. Pending re-examination, one may hazard the opinion that all Australasian examples will be referred to *Eusiroides* (*monoculoides* Hasw.), but not to *Bovallia*.

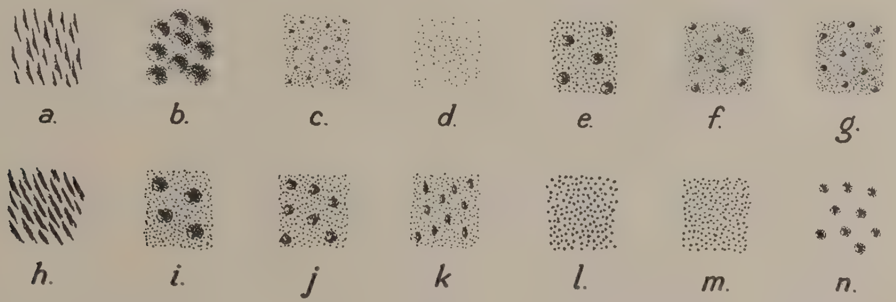

Fig. 118. Portions of the integuments, highly magnified, of various *Pontogeneiidae: a. Bovallia gigas* and *Djerboa furcipes. b. Eurymera monticulosa. c. Schraderia gracilis. d. Prostebbingia gracilis. e. Atyloella dentata. f. Pontogeneiella brevicornis* and *longicornis. g. Pontogeneia simplex* and *Atyloella magellanica. h. Pontogeneia antarctica* and *georgiana. i. Paramoera gregaria. j. Paramoera obliquimanus. k. Paramoera tristanensis. l. Paramoera walkeri* and *hermitensis. m. Pontogeneia tristanensis* and *Paramoera edouardi* and *bidentata. n. Paramoera capensis.*

Bovallia gigantea is a perfectly well-defined species with a definite distribution.

Pfeffer recorded specimens of 45 mm. length, and orange- to purple-red in colour. Chevreux (1913) records his specimens as being greenish brown, reddish above, eyes brick-red. The colour of no. 1 is given as: "Dragons-blood red (Ridgway 5′ OO–R) darkest on back, palest laterally and on appendages. Eyes dark grey".

DISTRIBUTION. South Georgia; South Orkneys, shore and shallow water; South Shetlands, littoral; Palmer Archipelago, 0–5 m.

Genus Eurymera, Pfr.

Pfeffer, 1888, p. 102.
Stebbing, 1906, p. 356.
Schellenberg, 1929 *a*, p. 277.

Eurymera monticulosa, Pfr. (Fig. 118 *b*).

Pfeffer, 1888, p. 103, pl. i, fig. 3.
Chevreux, 1906, p. 59, figs. 34–36; 1913, p. 167.
Chilton, 1912, p. 493.
Shoemaker, 1914, p. 74.

Occurrence: 1. St. 174. South Shetlands. 1 ♀ 23 mm.
2. St. 179. Palmer Archipelago. 46 ♂♂ and ♀♀ up to 20 mm., 3 juv. 6–7 mm.

Remarks. Integument coarsely pitted all over.

Distribution. South Georgia; Graham Land, littoral; South Orkneys, 4 fathoms.

Genus **Pontogeneia**, Boeck.

Schellenberg, 1929 *a*, p. 277; 1931, p. 181.

The number of simple unexpanded flagellar joints on antenna 1 separating every two of the dilated joints which bear sensory filaments appears to be a good specific character, but only in adult animals. Compare the adult and young of *tristanensis* (*infra*). Other characters should of course be utilized in conjunction.

Pontogeneia simplex (Dana) (Fig. 118 *g*).

Dana, 1853/55, p. 926, pl. lxiii, fig. 2.
Bate, 1862, p. 140, pl. xxvii, fig. 2 (after Dana).
Chilton, 1912, p. 495 (*danai*, *non* Thoms.).
Schellenberg, 1931, p. 182, fig. 93.

Occurrence: St. 56. Falklands. 1 immat. ♀ 11 mm., 1 ovig. ♀ 14 mm.

Remarks. Integument minutely shagreened, with scattered pits. Every 5th or 6th flagellar joint on antenna 1 enlarged and bearing sensory filamentous setae. Flagella of both antennae more thickly spinulose than in *antarctica*, Chevr.

In the present state of our knowledge I prefer to identify these specimens with Dana's species originally collected at Hermite Island than with a New Zealand species. They are in all probability adults of the same form as Chilton examined.

Distribution. Hermite Island, Cape Horn; Falkland Islands.

Pontogeneia georgiana (Pfr.) (Figs. 118 *h*, 119).

Pfeffer, 1888, p. 116, pl. ii, fig. 6 (*Calliopius g.*).
Stebbing, 1906, p. 308 (*Apherusa g.*).
Schellenberg, 1929 *a*, p. 278; 1931, p. 184, fig. 94.

Occurrence: East Cumberland Bay, South Georgia. 1 ♀ 13 mm., 2 mutilated ♀♀.

Remarks. Although Pfeffer said that, next to *Schraderia gracilis*, this was the commonest Amphipod in South Georgia, there are only these three specimens in the present collection.

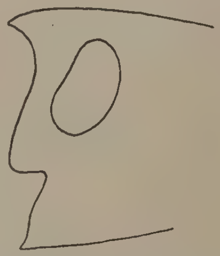

Fig. 119. *Pontogeneia georgiana* (Pfr.). Head.

They entirely conform with Pfeffer's description. The postero-inferior angle of pleon segment 3 is not mentioned in the description but the figure shows it as rounded-quadrate; in these specimens it is broadly rounded exactly as in *antarctica*, Chevr. Every alternate flagellar joint of antenna 1 is enlarged and bears sensory setae. The integument is covered with close-set lenticular impressions (or scale-like imbrications, if preferred), more or less horizontal anteriorly, becoming vertical (transverse) on the posterior segments. Pfeffer's description of the telson is correct, except that it really is cleft; a very slight pressure of the dissecting needle is enough to separate the two lobes.

DISTRIBUTION. South Georgia.

Pontogeneia antarctica, Chevr. (Fig. 118 *h*).

Chevreux, 1906, p. 69, figs. 40, 41; 1913, p. 177, fig. 59.
Chilton, 1912, p. 496; 1925, p. 178.
? *Non* Stebbing, 1914, p. 364.
Non Stephensen, 1927, p. 319, figs. 10, 11.
Schellenberg, 1931, p. 185.

Occurrence: 1. St. 166. South Orkneys. Many ♂♂, ♀♀ and juv. 6–16 mm.
2. St. 179. Palmer Archipelago. 7 ♂♂ 11–12 mm., 24 ♀♀ 11–17 mm.

REMARKS. Integument with close-set elongate lenticular impressions, exactly as in *georgiana*. Every 3rd flagellar joint of antenna 1 enlarged.

I fail to find any characters separating this species from *georgiana* except the number of joints separating every pair of enlarged joints on antenna 1. The anterior margin of the head is the same in the actual specimens, though Chevreux's figure of this in *antarctica* differs slightly, but not essentially, from that here given for *georgiana*.

The straight line forming the junctions of the side-plates with the peraeon segments in Chevreux's figure appears diagrammatic when compared with the actual specimens; Pfeffer's description and figure fit these specimens perfectly. It is of course only a phenomenon of preservation, but many of these specimens exhibit the same loosely articulated segments as described by Pfeffer in *georgiana*.

DISTRIBUTION. Graham Land; Petermann Island; South Shetlands; South Orkneys, 0–6 m.

Pontogeneia tristanensis, n.sp. (Figs. 118 *m*, 120).

Occurrence: St. 5. Tristan da Cunha. 3 ♂♂ 6–7 mm., 2 ♀♀ 7–9 mm., several juv. 3–5 mm.

DESCRIPTION. Integument minutely shagreened, without pits. Postantennal angle of head quadrate, the actual angle rounded. Eyes subcircular. None of the peraeon or pleon segments dorsally dentate. Side-plates 1–4 shallow, 4 subtriangular, feebly excavate on hind margin. Pleon segment 3 narrowing below on the pleural portion, which is completely rounded on lower and hind margin. Telson twice as long as broad, of nearly equal width throughout, cleft for one-quarter its length, lobes dehiscent, apices narrowly rounded, no setules or spines.

Antenna 1, flagellum with every 3rd or 4th joint in ♂, every 4th joint in ♀, enlarged. In the young every alternate joint is enlarged.

Gnathopods 1 and 2 as in *antarctica*, Chevr. Peraeopods 3–5, 2nd joint in peraeopods 3 and 4 oval, in peraeopod 5 oblong, the hind margin straight or even inclined to be very slightly concave, lower hind angle rounded.

Remarks. This, the first example of the genus to be recorded from this island, appears to be a good species characterized by the 4th side-plate, 3rd pleon segment, post-antennal angle of head, and eye, in combination with the flagellum of antenna 1.

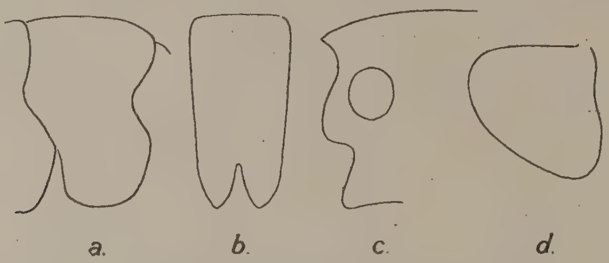

Fig. 120. *Pontogeneia tristanensis*, n.sp. *a*. Pleon segment 3. *b*. Telson. *c*. Head. *d*. Side-plate 4.

Genus **Pontogeneiella**, Schell.

Schellenberg, 1929 *a*, p. 278.

In explanation of the terms "schuppen-förmig" (key, p. 276) and "flache lamella" (p. 278) used by Schellenberg in describing the rudimentary accessory flagellum, it may be stated that they refer merely to the distal margin of the 3rd peduncular joint. There is no *articulated* accessory flagellum or rudiment thereof.

Pontogeneiella brevicornis (Chevr.) (Fig. 118 *f*).

Chevreux, 1906, p. 79, figs. 45–47; 1911, p. 403.
Chilton, 1925, p. 178.
Schellenberg, 1929 *a*, p. 278.

Occurrence: 1. St. 165. South Orkneys. 1 ♀ 22 mm. (antennae lost) from stomach of *Notothenia*.
2. St. 173. South Shetlands. 5 ♂♂ 12–13 mm., 11 ♀♀ 12–15 mm.
3. St. WS 56. South Georgia. 3 immat. ♀♀ 18 mm.

Remarks. Integument minutely shagreened, with scattered pits.

Distribution. Palmer Archipelago; South Orkneys; South Sandwich Islands.

Pontogeneiella longicornis (Chevr.) (Fig. 118 *f*).

Chevreux, 1906, p. 84, figs. 48–50; 1913, p. 179.
Schellenberg, 1929 *a*, p. 278; 1931, p. 190.

Occurrence: 1. St. 190. Palmer Archipelago (315 m.). 1 immat. ♀ 26 mm.
2. St. WS 25. South Georgia. 1 ♀ 18 mm.
3. St. MS 10. South Georgia. 3 ♀♀ 15–21 mm.
4. St. MS 67. South Georgia. 1 ♀ 15 mm.

Remarks. Integument as in *brevicornis*. There would seem to be considerable likelihood of this species being merged in *brevicornis*. The serration of the hind margin of the 2nd joint of peraeopods 4 and 5, the length of the antennae, and the size of the eye, would not appear from an examination of the present specimens to be clear-cut differential features.

DISTRIBUTION. Palmer Archipelago, 25–129 m.; Petermann Island, 40–60 m.

Genus **Prostebbingia**, Schell.

Schellenberg, 1926, p. 357; 1929 *a*, p. 278.

Prostebbingia gracilis (Chevr.) (Figs. 118 *d*, 121).

Chevreux, 1913, p. 173, figs. 56–58.
Schellenberg, 1926, p. 358.

Occurrence: 1. St. 173. South Shetlands. Many ♂♂ and ♀♀ 5–10 mm.
2. St. 175. South Shetlands. 7 ♀♀ 10–13 mm.
3. St. 179. Palmer Archipelago. 4 ♀♀ 9–12 mm., 2 juv. 6 mm.
4. St. MS 67. South Georgia. Many ♂♂ and ♀♀ 5–10 mm.
5. St. MS 71. South Georgia. 6 ♀♀ 6–10 mm.
6. St. MS 74. South Georgia. 3 ♂♂ 5–6 mm., 4 ♀♀ 6–7 mm.

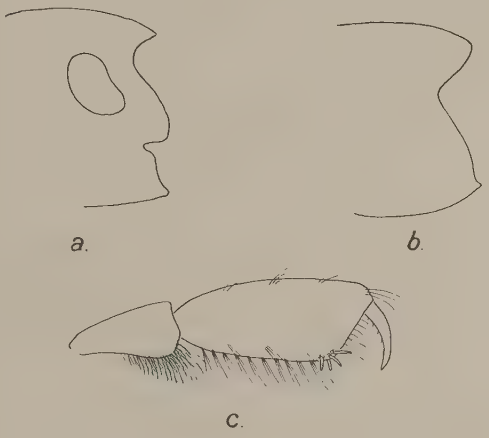

Fig. 121. *Prostebbingia gracilis* (Chevr.). *a*. Head. *b*. Pleon segment 3. *c*. Gnathopod 2.

REMARKS. The integument is so minutely shagreened as to appear almost nitidulous.

The larger specimens, especially those from St. 175, have heavier gnathopods, a rather more prominent post-antennal angle on head, and a small though distinct point on the postero-inferior angle of pleon segment 3. These features are here figured, but I do not propose even a varietal name as there appears to be no clear-cut demarcation between the forms.

DISTRIBUTION. Petermann Island and Marguerite Bay, 5–254 m.; 'Gauss' winter station, 170 m.

Genus **Atyloella**, Schell.

Schellenberg, 1929 *a*, p. 279.

The discovery of a dentate species confirms Schellenberg's words "Körper glatt oder gezähnt" in the generic diagnosis.

Atylopsis quadridens, Brnrd. 1930, may belong here, but at the time the Terra Nova Report was written Schellenberg's 1929 paper had not reached me, and I was not clear as to the limits of the various genera.

Atyloella magellanica (Stebb.) (Fig. 118 *g*).

Stebbing, 1888, p. 925, pl. lxxix; 1914, p. 365.
? Shoemaker, 1914, p. 75.
Non Chevreux, 1906, p. 64; 1913, p. 178 (= *Paramoera edouardi*).
Non Walker, 1907, p. 33, pl. xii, fig. 20 (= *Prostebbingia serrata*).

Occurrence: 1. St. 56. Falklands. 1 ovig. ♀ 8 mm.
2. St. 58. Falklands. 2 ♂♂ 7·5 mm.

REMARKS. Integument minutely shagreened, with scattered pits. Antero-lateral margin and post-antennal angle of head as in the following species *dentata*.

Stephensen (1927, p. 325) queries Stebbing's Falkland Island record. In view of the present records I think we may accept Stebbing's identification, even though he does include Chevreux's *magellanica* (= *edouardi*), which has no epistomal process, in his synonymy.

The impression given by Stebbing's small figure that the post-antennal angle of the head is acute, is here confirmed. I therefore exclude Schellenberg's 1926 record, which represents a different species with rounded post-antennal angle, unless his description refers only to the projecting antero-lateral margin. In any case the depth of the Gauss capture, 385 m., seems a little anomalous for the present species.

DISTRIBUTION. Cape Virgins, 55 fathoms; Falkland Islands; ? South Georgia.

Atyloella dentata, n.sp. (Figs. 118 *e*, 122).

Occurrence: 1. St. 51. Falklands. 3 ♀♀ 8–12 mm., the largest ovigerous. *Types*.
2. St. WS 79. Between Falklands and South America. 1 ♀ 9 mm.

DESCRIPTION. Integument minutely shagreened, stronger than in *magellanica*, with scattered pits, some of which on the posterior segments are often replaced by elongate lines. Rostrum short. Antero-lateral margin of head produced in a narrowly rounded lobe, post-antennal angle acutely produced. Eyes large rounded-oblong. Peraeon segment 7 and pleon segments 1–3 dorsally carinate, the carinae on peraeon segment 7 and pleon segments 1 and 2 forming an acute tooth, that on segment 3 rounded. Side-plate 1 widening slightly below as in *magellanica*. Pleon segments 1 and 2 each with a small denticle in middle of lateral margin; postero-inferior angle of segment 1 with a very small point, of 2 and 3 acutely produced. Telson concave above, oblong, apically incised

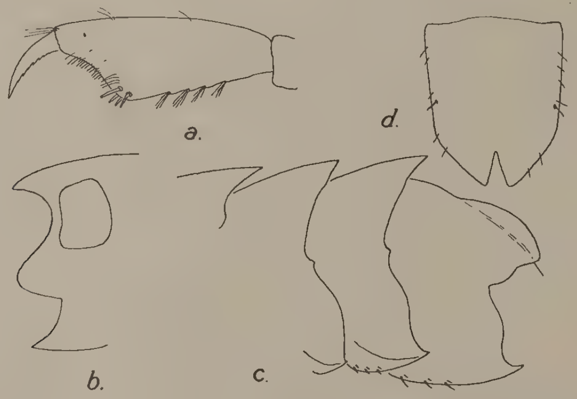

Fig. 122. *Atyloella dentata*, n.sp. *a*. Gnathopod 2 ♀. *b*. Head. *c*. Peraeon segment 7 and pleon segments 1–3. *d*. Telson.

for about one-quarter its length, lobes dehiscent, broad, several setules and one spine along lateral margin.

Epistome with an acute spiniform process, longer and more prominent than in *magellanica*. Antenna 1 with a minute 1-jointed accessory flagellum, and a sensory filament on every alternate joint of the flagellum.

Gnathopods 1 and 2 as in *magellanica*, but palm in gnathopod 2 more oblique and distinctly concave, with rounded defining angle bearing four spines.

REMARKS. An interesting addition to the genus, and quite distinct from *magellanica*.

Genus **Djerboa**, Chevr.

Chevreux, 1906, pp. 74.
Schellenberg, 1929 *a*, p. 279.

Djerboa furcipes, Chevr. (Fig. 118 *a*).

Chevreux, 1906, p. 74, figs. 42–44; 1913, p. 179, fig. 60.
Chilton, 1912, p. 500.
Shoemaker, 1914, p. 75.
Schellenberg, 1926, p. 363.

Occurrence: 1. St. 141. South Georgia. 6 ovig. ♀♀ 16–18 mm.
2. St. 145. South Georgia. Many ♂♂, ♀♀ and juv. 10–21 mm., mostly ovig. ♀♀ 17–20 mm.
3. St. 179. Palmer Archipelago. 2 ♂♂ 10 and 12 mm.
4. St. WS 25. South Georgia. 2 ♀♀ 21–22 mm.
5. St. WS 62. South Georgia. 2 ♀♀, 1 ovig. ♀, 17–18 mm.
6. St. MS 10. South Georgia. 1 ♂ 12 mm., 7 ♀♀ (3 ovig.) 16–20 mm. (mutilated).
7. St. MS 32. South Georgia. 1 ♂ 13 mm., 3 ♀♀ 15–16 mm., 6 ovig. ♀♀ 16–18 mm.
8. St. MS 65. South Georgia. 5 ♂♂ 10–11 mm., 6 ♀♀ 9–17 mm., 1 ovig. ♀ 17 mm.
9. St. MS 67. South Georgia. A lot ♂♂, ♀♀ and juv. 3–18 mm., incl. ovig. ♀♀.
10. St. MS 71. South Georgia. Fifteen specimens 6·5–12 mm.
11. St. MS 74. South Georgia. Forty-three specimens 8–13 mm.

REMARKS. Chilton has noted the impressions in the integument. They are more or less horizontal on the anterior part of the body, becoming oblique and then transverse posteriorly. So far from helping to distinguish *Djerboa* from *Oradarea*, they accentuate the likeness between these two genera.

The eye of the ♂ is not reniform, but similar to that of the ♀. The ♂♂ from St. MS 65 have long coiled masses of spermatozoa issuing from the penes (cf. *Chosroës*, Barnard, 1930, p. 370, fig. 38 *b*).

DISTRIBUTION. Graham Land, 3–5 m.; South Orkneys, 10–15 m.; South Georgia; Kerguelen.

Genus **Schraderia**, Pfr.

Pfeffer, 1888, p. 141 and pl. ii, fig. 5.
Stebbing, 1888, p. 913 (*Atyloides*); 1906, p. 362 (*Atyloides*).
Schellenberg, 1929 *a*, p. 280 (*Atyloides*).

REMARKS. Firstly, Chilton has examined specimens labelled "*Schraderia gracilis*" (1912, p. 497) which he said were referrable to *A. serraticauda*, Stebb. Though Chilton was perhaps right in saying that a general habitus figure was not good enough to determine a species in a group where so many species bear a close superficial likeness, one might maintain that Pfeffer has figured the characteristic gnathopods rather well, yet it is to be presumed that the specimens he examined were part of Pfeffer's type material. Therefore Chilton was justified when he presumed the identity of Stebbing's and Pfeffer's species. I say presumed, because I am sure that if Chilton had really subjected his material to a critical examination he would have noticed the distinctions between the two forms.

Secondly, as to the validity of Pfeffer's names. According to the Zoological Rules and Opinions, a figure is good enough to determine a *species*, and in the case of monotypic genera the species confirms the genus. Therefore both of Pfeffer's names are valid and as they antedate Stebbing's names[1] we should have to suppress the latter even if the conclusions set out below, as to *serraticauda* being a separate species, be not accepted.

Moreover it rather seems as if *Atyloides*, proposed by Stebbing for specimens which he referred to *Paramoera australis*, and to which he added two new species of his own, should become a synonym of *Paramoera* rather than of *Schraderia*. But this is a minor point, compared with the vindication of Pfeffer's names.

Schraderia gracilis, Pfr. (Figs. 118 *c*, 123).

Pfeffer, 1888, p. 141 and pl. ii, fig. 5 (habitus figure only).
? Walker, 1903, p. 58, pl. xi, fig. 90 (*serraticauda*, *non* Stebb.).
? Chilton, 1912, p. 497 (*serraticauda*, *non* Stebb.) and p. 497, pl. ii, figs. 21–23 (*calceolata* ♂); 1921, p. 224 (part).
? Chevreux, 1906, p. 87; 1913, p. 179.
? Schellenberg, 1929 *a*, p. 280 (*Atyloides g.*).
? Barnard, 1930, p. 388 (*P. serraticauda*, *non* Stebb.).

Occurrence: 1. St. 27. South Georgia. 2 ♂♂ 8–9 mm., 1 ♀ 11 mm.
2. St. 141. South Georgia. Many 6–16 mm., mostly ovig. ♀♀ 10–16 mm.
3. St. 144. South Georgia. 2 ♂♂ 8–10 mm., 1 ovig. ♀ 12 mm.
4. St. 145. South Georgia. 40 ♀♀, incl. ovig., 11–14 mm.
5. St. 159. South Georgia. 2 ♀♀ 11–12 mm.
6. St. WS 25. South Georgia. 1 ovig. ♀ 10 mm., 2 ovig. ♀♀ 13 mm.
7. St. WS 56. South Georgia. 1 immat. ♀ 16 mm.
8. St. MS 6. South Georgia. 7 ♀♀ (5 ovig.) 10–12 mm.
9. St. MS 10. South Georgia. 1 immat. ♀ 11 mm.
10. St. MS 67. South Georgia. 1 ♀ 12·5 mm.

REMARKS. In the form known as *serraticauda*, auctorum, it has been alleged by Walker, Chilton and Chevreux that considerable variation occurs in the number of serrations on the postero-inferior margin of pleon segment 3. This variation is said by Chilton and more definitely by Chevreux (1913) to vary according to the size of the animal, small specimens having two teeth as in the Challenger type, larger ones 7–10 teeth. On this account no doubt has hitherto been expressed as to the identity of the Australasian and Antarctic specimens, and the "species" has been credited with a wide distribution. It should be noted that not a single large or small specimen with numerous teeth has yet been recorded from the Australasian region.

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[1] Though the month of publication of the respective papers is not apparent, Stebbing (1888, vol. II, p. 1653) includes a précis of Pfeffer's paper, and on p. 1654 definitely states that *Stebbingia*, Pfr., would have priority over *Atyloides*, Stebb., if the two were considered identical. This proves that Pfeffer's paper was published before the Challenger Report.

The examination of the Discovery collection has led me to doubt both the variability and the wide distribution, and to believe that two distinct species have been united.

Stebbing (1888, pl. lxxviii) gives a general habitus figure of the Australian *serraticauda* showing on the head below the antero-lateral rounded projection, and separated from it by a slight indent, a very shallow "cheek" with a rounded post-antennal corner. Stephensen (1927, p. 339) in commenting on Auckland Island specimens says "the outline of the face is as shown by Stebbing...thus there is no projecting post-antennal corner". This is a very welcome corroboration of Stebbing's accuracy. No other author has referred to this point. Chilton's fig. 21 (1912) stops just short of including the decisive feature.

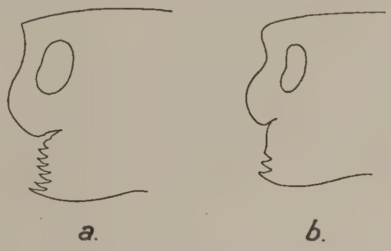

Fig. 123. *Schraderia gracilis* (Pfr.). Head of: *a*. Adult. *b*. Young (6 mm.).

But if Stebbing's and Pfeffer's figures are compared it will be seen that they do not agree. Pfeffer shows a deep cheek with a quadrate though not projecting post-antennal corner. As I have elsewhere remarked Pfeffer had a very accurate draughtsman, though in the case of *S. gracilis* he has omitted the serrations on the pleon segment 3 and on the anterior margin of the cheek. But it is quite evident that the specimens here examined, from the type locality, conform with those Pfeffer had.

I am thus led to conclude that there is an Antarctic form with deep, serrated cheeks and numerous serrations on the margin of pleon segment 3; and an Australasian form with shallow, entire cheek and a bidentate postero-inferior corner on pleon segment 3. These two forms ought certainly to be recorded separately, and I am of opinion that both should be given specific rank. Stebbing's *serraticauda* thus becomes the second species of *Schraderia*.

Owing to the unfortunate overlooking of this diagnostic character all the Antarctic records are open to doubt, though one feels fairly safe in assuming that those given above, with query marks against them, will on re-examination be found to apply to *gracilis*.

The references to *serraticauda* are as follows:

Stebbing, 1888, p. 920, pl. lxxviii; 1906, p. 362.
? Chilton, 1909, p. 627.
Stephensen, 1927, p. 339.

The integument in *gracilis* is minutely shagreened, with minute scattered pits, from which an occasional seta arises.

DISTRIBUTION. South Georgia. Probable but requiring confirmation: Graham Land; South Orkneys; Ross Sea area.

Genus **Paramoera**, Miers.

Pfeffer, 1888, p. 110 (*Stebbingia*).
Stebbing, 1888, p. 913 (*Atyloides*); 1906, p. 363.
Schellenberg, 1929 *a*, p. 280; 1931, p. 194.

Paramoera walkeri (Stebb.) (Fig. 118 *l*).

Walker, 1903, p. 58, pl. xi, figs. 91–97.
Chevreux, 1913, p. 169, figs. 53–55.
Schellenberg, 1929 *a*, p. 281.
Barnard, 1930, p. 388.

Occurrence: St. 173. South Shetlands. 2 immat. ♀♀ 10 and 12 mm.

REMARKS. Integument finely shagreened, without larger pits.

DISTRIBUTION. Ross Sea area, 0–10 fathoms; South Shetlands, littoral. Collected also at South Georgia by Major Barrett-Hamilton, see Appendix, p. 315.

Paramoera gregaria (Pfr.) (Figs. 118 *i*, 124).

Pfeffer, 1888, p. 110, pl. ii, figs. 7 and 7 *a–d* (*Stebbingia g.*).
Stebbing, 1906, p. 358.
Chilton, 1913, p. 58 (*austrina*, *non* Bate).
? Shoemaker, 1914, p. 75 (*austrina*, *non* Bate).
? Pesta, 1928 (*Ann. Nat. Mus. Wien*, XLII), p. 78 (*capensis* f. *austrina*, *non* Dana, Bate).
Non Walker, 1907, p. 33.

Occurrence: 1. New Fortuna Bay, South Georgia. Many ♂♂, ♀♀ and juv. 6–17 mm. (beach).
2. St. 222. Cape Horn. Many ♂♂, ♀♀ and juv. 8–17 mm. (beach).

REMARKS. Integument minutely shagreened, with rather large and numerous pits.

From the figures here given I think there will be no doubt as to the identity of these specimens with Pfeffer's species. Though Pfeffer says it is the commonest Amphipod in South Georgia, there is only the one lot from that locality.

Pfeffer did not mention or figure any accessory flagellum; it is present as a 1-jointed articulated rudiment on the present specimens. I do not consider this an insuperable difficulty, in view of the agreement in other features. If the accessory flagellum were absent in Pfeffer's specimens, they would be referable to *Pontogeneiella*, both species of which have long telsons, but the shape of the head and the postero-inferior corner of pleon segment 3, and the gnathopods, especially gnathopod 1, are conclusive against this assumption. Moreover Chilton when examining Pfeffer's material found the accessory flagellum was present (1912, p. 499) though he did not state this fact in his 1913 paper (p. 58).

These specimens show no resemblance to *australis*, Miers, or the Challenger specimens referred by Stebbing to Miers' species (which identification I think may be taken as correct, contrary to Walker's opinion 1907, p. 33). Whether *australis*, Miers, should be put into the synonymy of *austrina*, Bate, need not concern us here. The shape of the gnathopods of *austrina* (Bate, 1862, pl. xxvi, fig. 4) is distinctly more like those of the present specimens than are Miers' and Stebbing's figures of those of *australis*. But there are points in Bate's description and figures which preclude our identifying the present specimens with his species (e.g. the shape of head and pleon segment 3).

Schellenberg (1929 *a*, p. 280) refers *austrina* to Dana's *fissicauda* from Valparaiso. Dana's description and figures are quite useless in such a critical case as this.

I am not willing to identify these specimens with any Australasian species, nor with *fissicauda*, until specimens from the original localities have been subjected to a modern critical examination. It is better not to go farther back than Pfeffer's description, with which the Discovery specimens agree. It will at least be seen that a confusion with *capensis* is impossible.

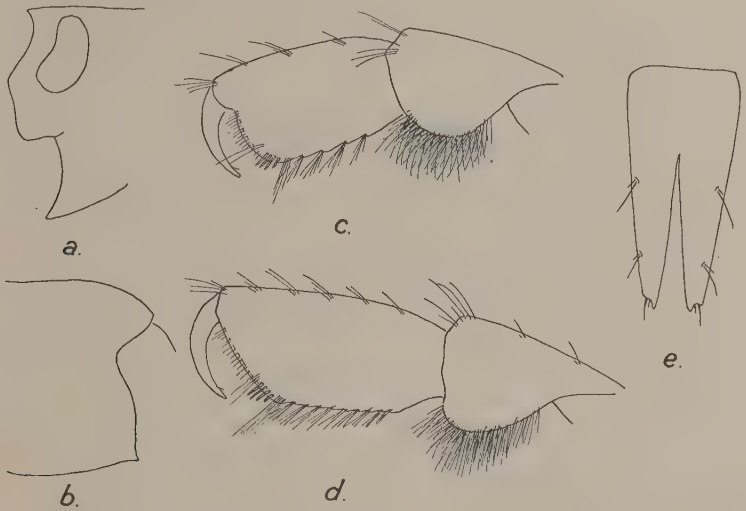

Fig. 124. *Paramoera gregaria* (Pfr.). *a*. Head. *b*. Pleon segment 3. *c*. Gnathopod 1. *d*. Gnathopod 2. *e*. Telson.

Schellenberg's remarks (1926, p. 357) on the genus *Stebbingia* hold good, and Pfeffer's species is merely transferred to *Paramoera*.

DISTRIBUTION. South Georgia.

Paramoera edouardi (Schell.) (Fig. 118 *m*).

Chevreux, 1906, p. 64, figs. 37–39 (*Pontogeneia magellanica, non* Stebb.); 1913, p. 178 (*Atyloides magellanicus, non* Stebb.).
Schellenberg, 1929 *a*, p. 281.
? Chilton, 1912, p. 496 (*Atyloides magellanicus, non* Stebb.).

Occurrence: St. 173. South Shetlands. 1 ovig. ♀ 11 mm.

REMARKS. Integument very minutely shagreened, without larger pits.

DISTRIBUTION. Graham Land, littoral; South Shetlands, low tide. ? South Orkneys.

Paramoera obliquimanus, n.sp. (Figs. 118 *j*, 125).

Occurrence: St. 54. Falklands. 2 ♀♀ 14–15 mm., 1 ♂ and 1 immat. ♀ 11 mm.

Description. Integument minutely shagreened, with scattered pits, which are not so large or so close together as in *gregaria*. No dorsal teeth. Post-antennal angle of head acutely produced. Side-plate 1 rounded below, with a rather strong spine postero-inferiorly. Pleon segment 3 with a small point at postero-inferior angle. Telson cleft for half its length, lateral margin convex, lobes apically notched, with one spine, two pairs of lateral spine-setae.

Antenna 1 with a calceolus on every alternate flagellar joint proximally; on the distal joints the calceoli are replaced by sensory filaments.

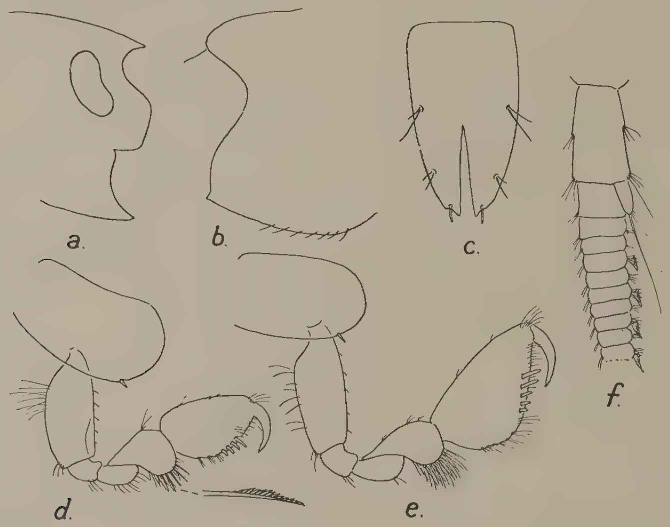

Fig. 125. *Paramoera obliquimanus*, n.sp. *a*. Head. *b*. Pleon segment 3. *c*. Telson. *d*. Gnathopod 1 ♀. *e*. Gnathopod 2 ♀. *f*. Portion of antenna 1.

Gnathopod 1, 5th joint rather strongly expanded in a rounded lobe inferiorly, 6th ovate, palm and hind margin forming a continuous curve, with four stout spines. Gnathopod 2, 5th joint as in gnathopod 1, 6th obliquely ovate, widest proximally, narrowing distally, palm not defined except by four to five stout spines.

Neither the ♂ nor the immature ♀ have the peculiarly shaped hands of the gnathopods found in the large ♀♀; they resemble more those of *fasciculata*, Thoms., as figured by Stephensen (1927, fig. 15), but have the 5th joint more strongly expanded inferiorly and lack the "rounded projection" or scarious edge mentioned by Stephensen.

Paramoera hermitensis, n.sp. (Figs. 118 *l*, 126).

Occurrence: St. 222. Cape Horn. 1 ♂ 8 mm., 6 ♀♀ 8–10 mm.

Description. Very like *edouardi*. Integumentary shagreen rather coarser, but still very fine. Eyes broadly reniform, large, dark. Post-antennal angle of head quadrate, but slightly produced. Pleon segment 3 with postero-inferior angle broadly rounded, obscurely serrulate. Telson, lateral margins slightly concave beyond the basal convexity, cleft for almost half its length, lobes apically subacute with a single spine in a notch.

Antenna 1, flagellum with sensory filaments on every alternate joint.

Gnathopods 1 and 2, 5th joint shorter than 6th, not strongly lobed below, 6th widening to the nearly transverse palm, which has three to four spines on the rounded defining angle.

REMARKS. The integument, gnathopods and telson prevent this form from being regarded as the same as the young specimen hesitatingly identified by Monod (1926) as *P. austrina*.

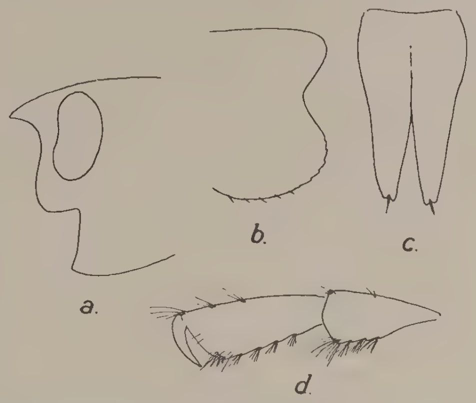

Fig. 126. *Paramoera hermitensis*, n.sp. *a*. Head. *b*. Pleon segment 3. *c*. Telson. *d*. Gnathopod 2.

Paramoera tristanensis, n.sp. (Figs. 118 *k*, 127).

Occurrence: 1. St. 6. Tristan da Cunha. 6 ♂♂ and 4 ovig. ♀♀ 6–7 mm. *Types*.
2. St. WS 123. Gough Island. 5 ovig. ♀♀ 7–9 mm. (shore).

DESCRIPTION. Integument minutely shagreened, with rather numerous pits, closer together than in *obliquimanus* and not as large as in *gregaria*. No dorsal teeth. Post-antennal angle of head quadrate. Eyes oblong, slightly larger in ♂ than in ♀. Side-plates 1 and 2 rounded below. Pleon segment 3 with postero-inferior angle broadly rounded, margin obscurely crenulate or serrulate. Telson half as long again as wide, cleft for about three-quarters its length, lateral margins convex, lobes slightly dehiscent, apices subacute, each with a single spine.

Antenna 1, flagellum with sensory filaments on every alternate joint.

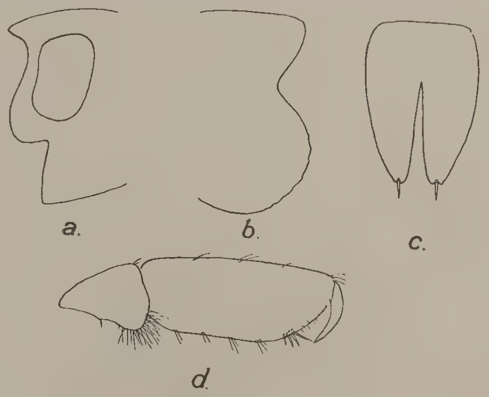

Fig. 127. *Paramoera tristanensis*, n.sp. *a*. Head. *b*. Pleon segment 3. *c*. Telson. *d*. Gnathopod 2.

Gnathopods 1 and 2, 5th joint rather short, subtriangular, 6th considerably longer than 5th, oblong-ovate, palm oblique, defined only by four spines.

Paramoera capensis (Dana) (Figs. 118 *n*, 128).

Dana, 1853/55, p. 931, pl. lxiii, figs. 5 *a–g*.
Bate, 1862, p. 141, pl. xxvii, fig. 4.
Stebbing, 1888, p. 918, pl. lxxvii (*Atyloides assimilis*).
Chilton, 1912, p. 499 (*austrina* "special variety").
Barnard, 1916, p. 183.
Schellenberg, 1925, p. 149; 1926, p. 363 (f. *capensis*); 1929 *a*, p. 280 (*fissicauda*, Dana, var. *capensis*).

Occurrence: St. MS 82. Saldanha Bay, South Africa. 20 ♀♀ 5–9 mm., the larger ovig.

REMARKS. Integument nitidulous, with numerous pits which in the posterior segments sometimes tend to become elongate so as to produce the appearance of short lines. This is especially noticeable in specimens from the more easterly localities (Port Elizabeth, East London and Natal), in which also the pits tend to be slightly stronger and closer together. Post-antennal angle of head rounded-quadrate.

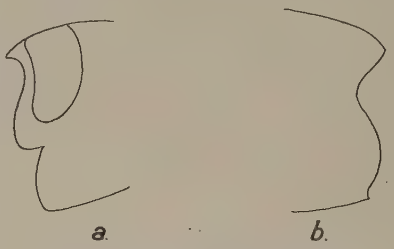

Fig. 128. *Paramoera capensis* (Dana). *a*. Head. *b*. Pleon segment 3.

Schellenberg (1925) has shown that the inclusion of *magellanica*, Stebb. (= *Atyloella m.*) in the synonymy which I gave in 1916 was wrong. I agree. On the other hand, I still maintain that *austrina*, excluded by me in 1916, is rightly excluded.

I see no possibility of including a species with a telson like that in Bate's figure (pl. xxvi, fig. 4) with *capensis*. The same applies to *australis*, Miers. The normal telson of the adult should be used as a criterion, and in *capensis* it is comparatively short and broad, with multidentate apices.

Moreover, the integument of *austrina* has yet to be recorded. In *australis* Stebbing describes it as scabrous on the posterior segments. In the two to three hundred specimens from various South African localities which I have examined, I have not found a trace of scabrous ornamentation.

There would appear to be no difficulty in finding differences (integument, shape of head, pleon segment 3, telson, etc.) if one looks for them, instead of endeavouring to find points of agreement with a view to recording one "widely distributed species."

DISTRIBUTION. South Africa, west coast as far north as Swakopmund, south coast as far east as Port Shepstone in Natal; St Helena (Schellenberg, 1926).

Paramoera bidentata, n.sp. (Figs. 118 *m*, 129).

Occurrence: South Africa, Kalk Bay (False Bay). 1 ♀ 15 mm. (S.A.M. Reg. no. 1294).

DESCRIPTION. Integument very minutely shagreened, without pits. Rostral point small, acute. Antero-lateral margin of head somewhat angular, post-antennal angle acutely produced. Eyes reniform, nearly meeting on top of head. Side-plates 1–4 moderate, lower margins not setose or serrate. Pleon segments 1 and 2 with the posterior margin produced in a medio-dorsal subacute triangular tooth, which is not carinal but lies flat; postero-inferior angle of segment 1 quadrate, of 2 quadrate with a very small point, the margin above slightly sinuate, of 3 quadrate with a small point, the margin above rather convex but not serrate; segment 4 with an unusually well-marked dorsal transverse depression. Telson twice as long as broad; cleft two-thirds its length, lateral margins nearly straight, apices acute with two unequal spiniferous notches, the outer being the larger and bearing the larger spine, two submarginal unequal spines near base.

Antenna 1, flagellum about 55-jointed, every alternate joint expanded and bearing sensory filaments.

Gnathopods 1 and 2 nearly similar, 5th joint shorter than 6th, not wider and not cup-shaped, 6th oblong, longer in gnathopod 2, palm oblique, straight, defined by two stout spines, hind margin setose.

Peraeopods 3–5, 2nd joint oblong, hind margin nearly straight in peraeopod 3, straight in peraeopod 4 and slightly concave in peraeopod 5, finely serrulate, postero-inferior corners rounded, 6th with five groups of spines on anterior margin, four on posterior margin.

Uropod 3, rami longer than peduncle, subequal, lanceolate, apically acute, margins with fairly closely set spinules, outer margin of outer ramus with six pairs of stouter spinules.

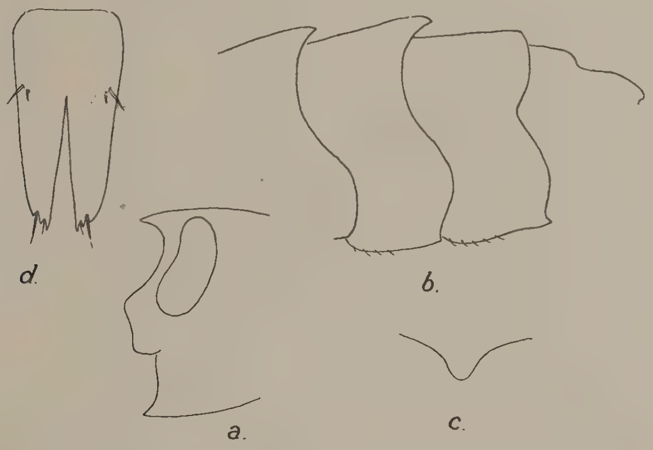

Fig. 129. *Paramoera bidentata*, n.sp. *a*. Head. *b*. Pleon segments 1–4. *c*. Dorsal view of tooth on segment 2. *d*. Telson.

Remarks. Similar to *edouardi* as regards integument, telson, and pleon segment 3, but separated by the head, dentate pleon segments 1 and 2, broader gnathopods, and oblong 2nd joints of peraeopods 3–5.

Although not represented in the Discovery collection, it is convenient to describe this species alongside other species of the genus.

Family GAMMARIDAE

Stebbing, 1906, pp. 364, 729.
Schellenberg, 1926, p. 363.

Genus **Melita**, Leach.

Stebbing, 1906, pp. 421, 732.
Barnard, 1916, p. 189.

Melita subchelata, Schell. (Fig. 130).

Schellenberg, 1925, p. 153 (*fresnelii*, var. *subchelata*).

Occurrence: St. WS Walvis Bay. 10 ♂♂ 7–10 mm., from stomach of *Trigla capensis*.

REMARKS. This form, to my mind, certainly deserves specific rank. In addition to the form of the hand of gnathopod 2 and the slight denticulation of the pleon segments, mentioned by Schellenberg, it may be stated that the 2nd joint of peraeopod 4 is produced at the distal corner (in *fresnelii* rounded-quadrate, not produced), and the 2nd joint of peraeopod 5 is wider distally than proximally (in *fresnelii*, *vice versa*). The inner ramus of uropod 3 is present as a small rudiment.

Of the present specimens six are left-handed, four right-handed.

DISTRIBUTION. South-west Africa, Luderitzbucht.

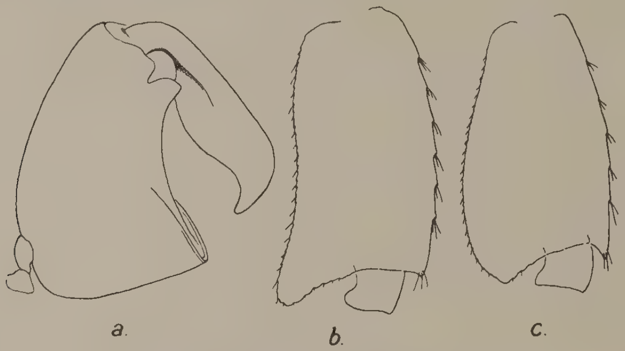

Fig. 130. *Melita subchelata*, Schell. *a*. Gnathopod 2 ♂. *b*, *c*. 2nd joints of peraeopods 4 and 5.

Melita inaequistylis (Dana).

Stebbing, 1914, p. 366.
Barnard, 1916, p. 191 (references).
Stephensen, 1927, p. 345.

Occurrence: St. 90. South Africa. 2 ♂♂ 9 and 12 mm., 1 juv. 8 mm.

DISTRIBUTION. New Zealand and neighbouring islands; Falkland Islands; Ceylon and India; South Africa.

Genus Maera, Leach.

Stebbing, 1906, pp. 433, 732.
Stephensen, 1925, p. 48.

Maera pfefferi, n.sp. (Fig. 131).

Occurrence: 1. St. 123. South Georgia. 1 ♂ 22 mm., 1 juv. 11 mm.
2. St. 144. South Georgia. 2 ♂♂ 14 and 21 mm., 2 immat. ♀♀ 19–20 mm.
3. St. 152. South Georgia. 1 ♂ 25 mm. *Type* ♀.
4. St. 156. South Georgia. 1 ♂ 25 mm. *Type* ♂.
5. St. 159. South Georgia. 1 ♀ 20 mm.

DESCRIPTION. Body elongate and slender. Rostrum obsolete. Eyes invisible. None of the peraeon and pleon segments dorsally dentate. Side-plates shallow, 1 quadrangular, antero-inferior angle slightly produced forwards in a sharp point, 4 not quite as deep as anterior lobe of 5, hind margin not emarginate. Pleon segment 3 with postero-inferior angle quadrate with a small sharp point. Telson longer than wide, cleft nearly half-way, lobes dehiscent, each apically notched, with a setule in the notch, the inner point slightly longer than the outer point.

Antenna 1 (♂) extending to end of 1st pleon segment, 1st and 2nd joints subequal, 3rd one-third length of 2nd, flagellum rather shorter than peduncle, 32-jointed, accessory flagellum 12-jointed. Antenna 2 shorter and more slender than antenna 1, 5th joint shorter than 4th, flagellum subequal to 5th peduncular joint, 12–14-jointed. Mouth-parts normal.

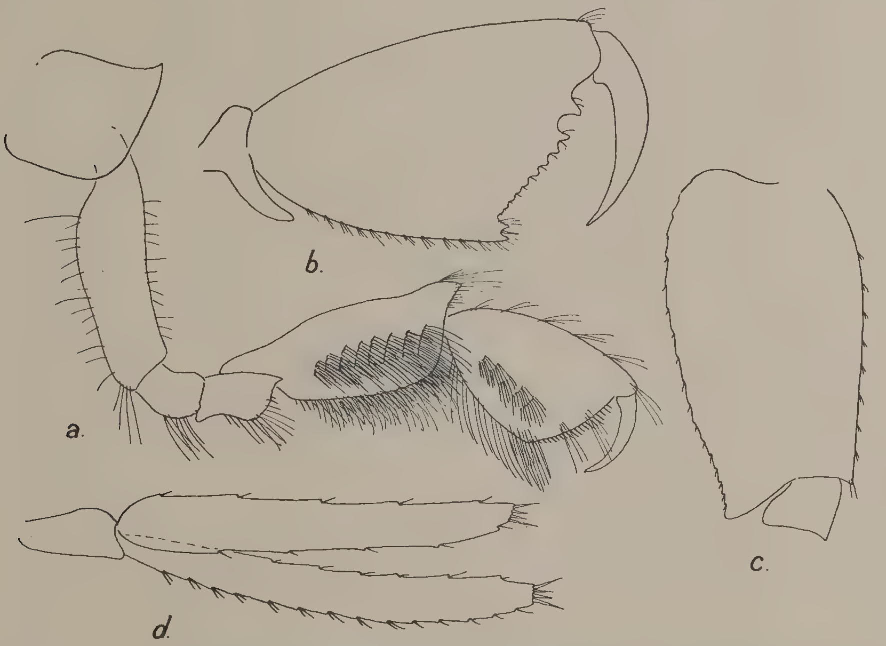

Fig. 131. *Maera pfefferi*, n.sp. *a.* Side-plate 1 and gnathopod 1. *b.* Gnathopod 2 ♀. *c.* 2nd joint of peraeopod 5. *d.* Left uropod 3 ♂, dorsal view.

Gnathopod 1, 5th joint subequal to 2nd, its upper apex produced as a short point overhanging base of 6th, in the juvenile as well as the adult, 6th shorter than 5th, ovate-triangular, palm somewhat oblique, with rounded defining angle and no spine, palmar margin spinulose, lower margins of 5th and 6th joints densely setose, and outer surfaces with several fascicles of setae arranged in rows. No sexual differences.

Gnathopod 2, 6th joint broadly ovate, hind margin with fascicles of short setae, rather longer than palm which is slightly oblique, defined by a strong, apically bifid tooth, two teeth near hinge, with a semicircular notch between them, margin between lower tooth and defining angle crenulate, a spinule in each notch. No sexual differences, except that in the ♂ the tooth nearest the hinge is broader and stronger. In the no. 1 ♂ the right hand is slightly larger than the left. In no. 1 juv. the palm is entire or only faintly crenulate.

Peraeopods 1 and 2 moderately slender. Peraeopods 3–5 moderately slender, 2nd joints expanded, oblong, about twice as long as broad, anterior and posterior margins subparallel in peraeopods 3 and 4, in peraeopod 5 posterior margin more convex, the width of the joint consequently more than half its length, postero-inferior angles in peraeopods 3 and 4 subquadrate, scarcely produced, in peraeopod 5 also subquadrate but produced in a lobe extending to end of 3rd joint, hind margin in all three peraeopods feebly serrate, 4th and 5th joints subequal.

Uropods 1 and 2, rami extending about equally far back, to a little beyond end of telson or end of peduncle of uropod 3. Uropod 3 in both sexes, rami very elongate, especially in ♂, longer than 2nd joint of peraeopod 5, nearly five times as long as peduncle, narrow, outer slightly longer than inner, apices truncate, with strong spines, margins, especially outer margin of outer ramus, spinulose. In no. 1 juv. the rami do not extend beyond rami of uropod 1, but in the young ♂ of no. 2 they are elongate.

REMARKS. In naming this species, the first true *Maera* to be recorded from the Antarctic, after Dr Georg Pfeffer, I return the compliment he paid to the English carcinologist E. J. Miers when he described "*Megamoera*" *miersii*, the first known Antarctic member of the family Gammaridae.

This species forms the counterpart to *M. loveni* (Bruz.) from the Arctic Ocean. In its slender body it bears a close resemblance both to *loveni* and also to *hirondellei*, Chevr. (1900, p. 84, pl. xi, fig. 1); with the latter it has in common the peculiar apical projection on the 5th joint of gnathopod 1[1]; and also the same type of hand in gnathopod 2, at least in the ♂. It is, however, easily distinguished by the enormously elongate rami of uropod 3 in ♂, a feature it has in common with *Paraceradocus miersii* (Pfr.)

Maera ascensionis, n.sp. (Fig. 132).

Occurrence: St. 1. Ascension. 4 ♂♂ 4·5 mm., 4 immat. ♂♂ 3·5 mm., 1 ovig. ♀ 4 mm.

DESCRIPTION. Eyes oval or subcircular. Peraeon and pleon not dorsally dentate. Side-plates entire on lower margins. Postero-inferior angle of pleon segment 3 quadrate, with a small point.

Antenna 1, accessory flagellum 7–8-jointed.

Gnathopod 1, 5th joint in ♂ with slight subapical depression on upper margin, apex slightly produced over base of 6th joint (cf. *pfefferi*, and footnote, *infra*). Gnathopod 2 in ♂, 6th joint oblong, nearly twice as long as broad, palm a little oblique, defined by two spiniform teeth, two small spines within the angle, one broad semicircular excision separated from a narrower excision nearer the hinge by a bifid tooth bearing two spines, a subtruncate spiniferous tooth near hinge, finger sinuate on inner margin. In immature ♂ the hand is narrower, palm more oblique, and the excisions not so deep. In ♀ the hand widens slightly to the oblique, convex, crenulate palm, which is defined from the hind margin by an obtuse angle, but no projecting tooth or spine.

Peraeopods 1 and 2 slender. Peraeopod 3, 2nd joint ovate, produced behind to end of 3rd joint, hind margin convex, serrulate, 4th strongly expanded, almost as wide as 2nd, 5th and 6th narrow, finger with accessory denticle on outside of unguis. Peraeopods 4 and 5, 2nd joints resembling that of peraeopod 3, 4th joint not expanded, twice as long as wide.

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[1] This occurs also in Kunkel's (1910) figures of *M. rathbunae*, and also to a less extent in his figure of *inaequipes*, as well as in Chevreux and Fage's (1925) figure of *inaequipes*.

Uropod 3, rami not extending beyond apices of rami of uropod 1, apices truncate.

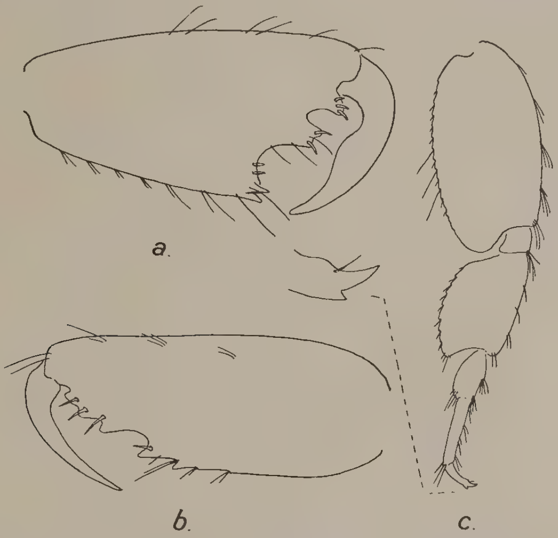

Fig. 132. *Maera ascensionis*, n.sp. *a*. Gnathopod 2 ♂. *b*. Gnathopod 2 of young ♂. *c*. Peraeopod 3, with dactyl further enlarged.

Remarks. The chief characteristic of this species is the expansion of the 4th joint of peraeopod 3, which isolates it from all the other species. The palm of gnathopod 2 in the ♂ might be regarded as a variant of that of *inaequipes*, but the hand is considerably longer in proportion to its breadth.

Genus **Paraceradocus**, Stebb.

Stebbing, 1906, p. 429; 1910, p. 597.

To complete the generic diagnosis it may be stated that the inner lobes of the lower lip are present (see also Stebbing, 1910, pl. li).

Paraceradocus miersii (Pfr.) (Fig. 133).

Pfeffer, 1888, p. 121, pl. iii, figs. 3 *a–e*.
Chevreux, 1906, p. 93; 1913, p. 180.
Chilton, 1912, p. 500; 1913, p. 59; 1925, p. 179.

Occurrence: 1. St. 45. South Georgia. 2 ♂♂ 31 and 42 mm.
2. St. 123. South Georgia. 1 juv. 16 mm.
3. St. 167. South Orkneys. 8 ♂♂ 55–66 mm., 4 ♀♀ 46–65 mm., 1 ♀ with embryos 60 mm., 4 ovig. ♀♀ 57–70 mm., 1 juv. ♂ 25 mm., 3 juv. ♀♀ 23–26 mm., 1 juv. 13 mm.

Remarks. This fine animal is unmistakable. Nevertheless one or two points in which the present specimens do not quite conform with Pfeffer's description may be noted.

As in the Scotia specimens the dorsal keel on pleon segments 1–3 is scarcely marked in the no. 3 specimens, though it is in both specimens of no. 1. The first side-plate is not as deep as its segment and is in fact slightly smaller than the 2nd. The telson is not longer than the 6th pleon segment. It is not so in Pfeffer's figure, and it seems possible that Pfeffer by a slip wrote "um ein Drittel länger" (p. 123) instead of "...kürzer".

The antennae are proportionately not so stout as in Pfeffer's figure. In gnathopod 2 the 6th joint is not as long as the 2nd; in the middle of the palm there is a short stout spine, followed by a step, the defining angle bearing a long slender spine as described by Pfeffer. The step in the palm is scarcely indicated in immature specimens of 23–26 mm. length. The 2nd joints of peraeopods 3–5 are quite different in lot no. 3, being much more elongate, and having the front and hind margins nearly straight and parallel, though converging slightly distally; the greatest breadth goes at least twice into the length in peraeopod 3, and $2\frac{1}{2}$–3 times in peraeopod 5. These three peraeopods are altogether longer than in Pfeffer's figure.

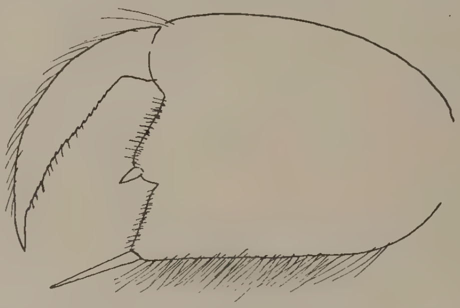

Fig. 133. *Paraceradocus miersi* (Pfr.). Gnathopod 2.

Comparing, however, the ♂ of no. 1 (42 mm.) with a 46 mm. ♀ of no. 3, we find that peraeopods 3–5 are all much shorter proportionately, peraeopod 5 of the ♂ only equalling peraeopod 3 of the ♀. The 2nd joints also are stouter, especially proximally. These specimens therefore approximate to the typical form.

The peduncle of uropod 1 has a well-marked tooth bearing a spine about midway on lower margin; Pfeffer's figure shows a spine nearer the base. The rami of uropod 3 are represented in Pfeffer's figure as much too broad, even for Pfeffer's description (here again a slip occurs: "Breite beim ♂ noch nicht $\frac{1}{4}$ der Breite", the last word should obviously be "Länge").

Lastly, the eye is not dark as in Pfeffer's figure, but shows through the cuticle as a whitish patch. The cuticle over the eyes is perfectly smooth, not in the least convex, and in no way different from the cuticle over the rest of the head. When dissected out, the eye is found to consist of a mass of whitish pigment-tissue with irregularly scattered, and not too closely aggregated, crystal-cones. The optic nerve is stout and apparently well developed. I have not had the time necessary for sectioning this eye, but the material seems to be in good condition for histological investigation, and the size of the animal would make it very convenient for study.

The no. 3 lot are far and away the largest yet recorded; they also come from much deeper water.

DISTRIBUTION. South Georgia; South Orkneys; Graham Land; South Shetlands. Low tide to 70 m.

Family DEXAMINIDAE

Stebbing, 1906, p. 514.
Schellenberg, 1928 (*Trans. Zool. Soc.*, pt. v), p. 652. (New genus and redefinition of *Dexaminoides* Spandl.)

Genus **Paradexamine**, Stebb.

Stebbing, 1906, p. 518; 1910, p. 602.
Chevreux, 1906, p. 88.
Barnard, 1930, p. 389.

Paradexamine fissicauda, Chevr.

Chevreux, 1906, p. 88, figs. 51–53; 1913, p. 181.
Chilton, 1912, p. 501 (*pacifica*, *non* Thoms.).

Occurrence: 1. St. 141. South Georgia. 1 ♂ 15 mm.
2. St. MS 63. South Georgia. 1 ♂ 11 mm.
3. St. MS 65. South Georgia. 1 ♂ 13 mm.
4. St. MS 66. South Georgia. 1 ♂ 14 mm.
5. St. MS 74. South Georgia. 1 ♂ 10 mm.
6. East Cumberland Bay, South Georgia. 1 ♀ 16 mm.

REMARKS. I see every reason for considering this species distinct from *pacifica*, and as noted in the Terra Nova Report the characters which separate the two species are the lateral angle of the head, the 2nd joint of peraeopod 5, and the telson. The 2nd joint of peraeopod 5 has a perfectly smooth and straight hind margin, devoid of setae except one large and one to two small ones at the distal corner.

Contrary to the opinion expressed in the Terra Nova Report, neither the 3rd uropods nor the antennae appear to exhibit sexual differences. All these appendages agree with Chevreux's account and figures. The absence of dense fascicles of setae on the antennae in *fissicauda* is therefore an additional distinction from *pacifica*.

DISTRIBUTION. Palmer Archipelago, 25–129 m.; South Orkneys, 2–10 fathoms.

Genus **Polycheria**, Hasw.

Stebbing, 1906, pp. 519, 735.
Schellenberg, 1931, p. 212.

Polycheria antarctica (Stebb.).

Chilton, 1912, p. 502 (literature and discussion).
Schellenberg, 1926, p. 370, fig. 58; 1931, pp. 214 *sqq.*, figs. 107–112.
Barnard, 1930, p. 390, fig. 49 *d*.
Non Barnard, 1916, p. 211 (= *atolli*).

Occurrence: 1. St. 39. South Georgia. Two specimens 3–3·5 mm.
2. St. 51. Falklands. Fourteen specimens 3–5 mm., apparently all ♀♀, from sponge.
3. St. 142. South Georgia. 1 ♂ 7 mm., 9 ♀♀ 6–8 mm., 3 juv. 3–4 mm.
4. St. 144. South Georgia. 1 ♀ 7 mm.
5. St. WS 27. South Georgia. 1 ♂ 4·5 mm.
6. St. MS 64. South Georgia. 4 ovig. ♀♀ 5 mm.
7. St. MS 71. South Georgia. One specimen 5 mm.

REMARKS. Maxillary palp and telson as in the *kergueleni* form. In uropod 3 both margins of the inner ramus and the inner margin of the outer ramus in the ♂ bear plumose setae; the inner margins of both rami of uropod 1 are also plumose.

DISTRIBUTION. Antarctic and sub-Antarctic regions.

Family TALITRIDAE

Stebbing, 1906, pp. 523, 735.
Kunkel, 1910 (*Trans. Conn. Ac.*, XVI), p. 61.

Genus **Orchestia**, Leach.

Stebbing, 1906, pp. 530, 735.
Chilton, 1909, p. 632; 1916 (*Trans. N.Z. Inst.*, XLVIII), p. 354.

Orchestia platensis, Kröy.

White, 1847 (List Crust. Brit. Mus.) (*tristensis*, Leach MSS.).
Bate, 1862, p. 19, pl. iii, fig. 3.
Stebbing, 1900 (*Fauna Hawaii*), p. 527, pl. xxi *A*; 1906, p. 540.
Walker, 1905 (*F. Geogr. Mald. Lacc.*, II, Suppl.), p. 924, fig. 2.
Kunkel, 1910 (*loc. cit.*), p. 63, fig. 24.
Shoemaker, 1920 (*Bull. Amer. Mus.*, XLIII), p. 377.
Chilton, 1921 (*Mem. Ind. Mus.*, v), p. 538, fig. 7.
Schellenberg, 1926, p. 371.

Occurrence: 1. St. 5. Tristan da Cunha. 9 ♂♂ 11–13 mm., 13 ♀♀ 9–14 mm. (shore).
2. Ditto. 2 immat. ♂♂ 7 mm., 1 ♀ 10 mm. (from stream through settlement).

REMARKS. Only the fully adult ♂♂ show the indented palm as figured by Chilton, younger specimens have an even palm as figured by Stebbing.

Some specimens from Tristan da Cunha have been for some years in the South African Museum (Reg. no. A 2941, coll. Benomi, 1904), and I identified them with *platensis*. They were, however, too mutilated to make the identification certain. The present specimens confirm the presence of this species (which does seem to be widely distributed) on this island where it was first collected by Capt. Carmichael.

Chilton (1921) suggests that there was probably an error in the label (20 fathoms) attached to the specimens from the Maldive Archipelago (Walker, 1905).

DISTRIBUTION. Rio de la Plata; Atlantic coast of North America; Bermuda and West Indies; Mediterranean; Azores; Tristan da Cunha; Belgian Congo and Angola; Chilka Lake, Bengal; St Paul Island; Hawaii Islands. ? Maldive Archipelago, 20 fathoms.

Genus **Talorchestia**, Dana.

Stebbing, 1906, p. 543.
Barnard, 1916, p. 215.
Chilton, 1917 (*Trans. N.Z. Inst.*, XLIX), p. 292.
Schellenberg, 1925, p. 159.

Talorchestia scutigerula (Dana).

Bate, 1862, p. 26, pl. iv, fig. 7.
Stebbing, 1906, p. 544; 1914, p. 367.
Chilton, 1912, p. 508.

Occurrence: 1. St. 122. South Georgia. 2 ♂♂ 16–17 mm. (shore).
2. Undine Harbour, South Georgia. March 1926. Shore. 1 ♂ 17 mm., 2 ♀♀ 14–15 mm., 1 juv. 10 mm.

REMARKS. This species has not previously been recorded from South Georgia.

Note MS 7 states: "Specimens of Crustacea, Oligochaetes, Coleoptera, Dipterous larvae and puparia, and apterous Diptera found living together under stones at the upper edge of the beach at Undine Harbour, March 1926". (L. H. Matthews.)

DISTRIBUTION. Tierra del Fuego; Hermite Island; Falkland Islands.

Genus **Hyale**, Rathke.

Stebbing, 1906, pp. 559, 735.
Barnard, 1916, p. 229.

Hyale sp.

Occurrence: St. 2. Ascension. 1 ♂ and 1 ovig. ♀ 5·5 mm., nine other juv. and immat. specimens.

REMARKS. As the genus *Hyale* is a somewhat difficult one, and the present material so small, I prefer not to attach a specific name to these specimens.

The 2nd gnathopod in the ♂ is of the *hirtipalma* type, the palm not distinct from the hind margin, the finger about two-thirds the length of the hand; the palm bears a few setae and spinules.

Schellenberg (1926, p. 371) has recorded *camptonyx* from St Helena, but this species has an entirely different 2nd gnathopod.

Genus **Hyalella**, Smith.

Stebbing, 1906, pp. 574, 736.

Hyalella patagonica, Ortm. (Fig. 134).

Ortmann, 1911 (*Rep. Princet. Univ. Exp. Patag.*, III), p. 650, pl. xlviii, figs. 3 *a–h*.
Stebbing, 1914, p. 368.
Monod, 1926, p. 58, fig. 56 (*Hyalella* sp. juv.).

Occurrence: 1. St. 222. Hermite Island. 2 ♂♂ 10 mm., 1 immat. ♂ 6 mm., 6 ♀♀ 9–11 mm. (shore, fresh-water stream).
2. Ditto. 8 ♂♂ 9–10 mm., 2 immat. ♂♂ 6 mm., 10 ♀♀ 7–9 mm., 10 juv. 4–5 mm. (lakes, 300–350 ft. alt.).

REMARKS. The maxilliped in both sets of specimens agrees with Monod's figure in having the palpal joints broad and stout. Possibly Ortmann's figure was drawn from a specimen not fully flattened out, which would account for the narrowness of these joints. In other respects the coastal specimens agree with Ortmann's figures.

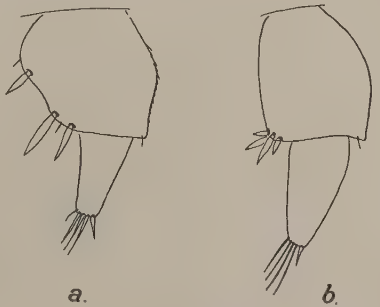

Fig. 134. *Hyalella patagonica*, Ortm. Dorsal view of left uropod 3 of: *a*. Specimen from shore. *b*. Specimen from lakes.

On the other hand, the specimens from the lakes at a higher altitude, while agreeing in most respects with the coastal specimens, differ in two respects. The 3rd uropod is slightly longer and less robust, the outer margin of the peduncle being straight instead of convex, and having a group of spines aggregated at the inner apex instead of three large ones distributed along the margin. The 1st gnathopod of the ♂ is not strongly expanded distally, and thus resembles more the 1st gnathopod of the ♀ of the coastal form.

In the absence of more abundant material, the best course is to regard these two sets of specimens as forms of the same species, and to identify them with Ortmann's species.

DISTRIBUTION. Patagonia, 47°–50° S, from coast up to 2000 ft. in the Cordilleras; Magellan Strait; Falkland Islands.

Genus **Allorchestes**, Dana.

Stebbing, 1906, p. 581.
Chilton, 1926, p. 515.

Allorchestes patagonicus, Cunningham (1871), remains obscure. It may be the same as *Hyalella patagonica*, Ortm., *supra*, but unless Cunningham's type can be found, it would be better to ignore his species.

Allorchestes sp.

Occurrence: St. WS 123. Gough Island. 1 immat. ♀ 11 mm. (shore).

REMARKS. It is unfortunate that there is only this single ♀ specimen, as no member of this genus has hitherto been recorded from either Tristan da Cunha or Gough Island.

Maxillary palp extending to apex of outer lobe. Gnathopod 2 a little longer than gnathopod 1, 2nd joint in both rather strongly keeled on anterior margin, 5th comparable with that figured for gnathopod 1 of *plumicornis* (Stebbing, 1899, *Trans. Linn. Soc. Lond.* (2), VII, pl. xxxiii *C*), equally strong in gnathopod 2, 6th broadly oval, especially in gnathopod 2.

Family AORIDAE

Stebbing, 1906, pp. 585, 736.
Schellenberg, 1925, p. 164.

Members of this family, though recorded from the sub-Antarctic (Kerguelen and South America) appear to be rare in the Antarctic regions. Some specimens were collected by the 'Gauss' but Schellenberg (1926, p. 374, fig. 60) was unable to refer them to any particular genus or species on account of the absence of the ♂. All the Discovery examples of this family were obtained in South African waters with the exception of two specimens from the Falkland Islands.

Genus **Aora**, Kröy.

Stebbing, 1906, p. 587.

Aora typica, Kröy.

Stebbing, 1906, p. 587, fig. 101.
Barnard, 1916, p. 236 (literature).
Schellenberg, 1926, p. 372 (fig. 59, forma *anomala*).

forma **gibbula**, n. (Fig. 135).

Schellenberg, 1926, p. 372.

Occurrence: St. 91. South Africa. 9 ♂♂ (adult and immat.) 3·5–5 mm.

REMARKS. The form here figured has already been reported by Schellenberg from South Africa. It is at least as distinctive as the other form recorded and figured by Schellenberg as forma *anomala*, and may also be designated by a name. For the present it may rank as a variety.

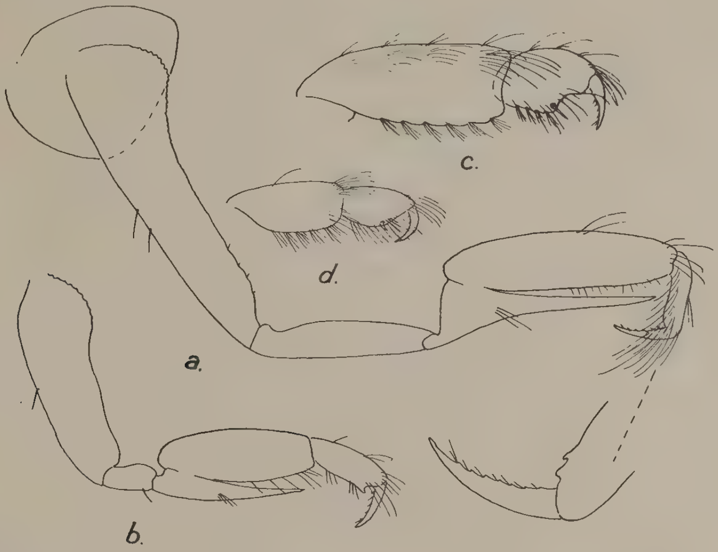

Fig. 135. *Aora typica*, Kroy. forma *gibbula* n. *a*. Side-plate 1 and gnathopod 1, with 6th and 7th joints further enlarged. *b*. Gnathopod 1, immature. *c*. Gnathopod 2. *d*. Gnathopod 2, immature.

In addition to the expanded base of the 2nd joint of gnathopod 1, the short 6th joint (relatively to the 5th) of gnathopod 2 with its excavate palm also seems distinctive. The 1st side-plate is very large and extends forwards over the side of the head.

DISTRIBUTION. (forma *gibbula*) Simon's Bay, South Africa.

Genus Lembos, Bate.

Stebbing, 1906, pp. 594, 737.
Barnard, 1916, p. 237.

Lembos hypacanthus, Brnrd.

Barnard, 1916, p. 237, pl. xxviii, figs. 5, 6.
Schellenberg, 1925, p. 166.

Occurrence: St. WS Walvis Bay. 3 ♂♂ 3·5–4·5 mm., 1 ♀ 4·5 mm., from stomach of *Trigla capensis*.

DISTRIBUTION. South Africa, Table Bay and False Bay; South-west Africa, Swakopmund.

Lembos fuegiensis (Dana) (Fig. 136).

Stebbing, 1914, p. 369, pl. ix.
Schellenberg, 1931, p. 231, fig. 117.

Occurrence: St. 51. Falklands. 1 immat. ♂ 8 mm., 1 ♀ 10 mm.

Remarks. It is highly probable that these specimens are specifically identical with those that Stebbing has already recorded from the Falkland Islands and referred to Dana's species. Whether it is really Dana's species is a question impossible to settle unless Dana's type is forthcoming. At any rate it would be safer to compare any Australasian or Indo-Pacific material with Stebbing's figures before claiming for this species a wide distribution. *L. kergueleni*, Stebb., may also prove to be distinct from the Falkland Islands species.

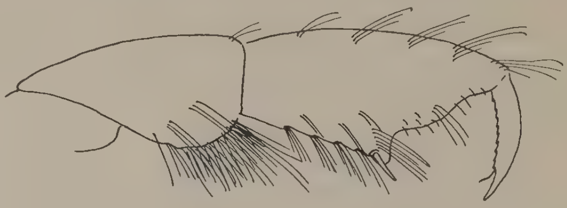

Fig. 136. *Lembos fuegiensis* (Dana). Gnathopod 1 ♀.

Colour (as preserved), whitish, head with grey vermiculations, eyes black, a greyish transverse band across each segment from peraeon segment 1 to pleon segment 3.

Distribution. Falkland Islands, 2–4 fathoms.

Genus **Lemboides**, Stebb.

Stebbing, 1906, p. 600.
Barnard, 1916, p. 239.

Lemboides afer, Stebb. (Fig. 137).

Stebbing, 1906, p. 600.
Schellenberg, 1926, p. 374.

Occurrence: St. 91. South Africa. 5 ♂♂ 5·5 mm., 9 ovig. ♀♀ 5 mm.

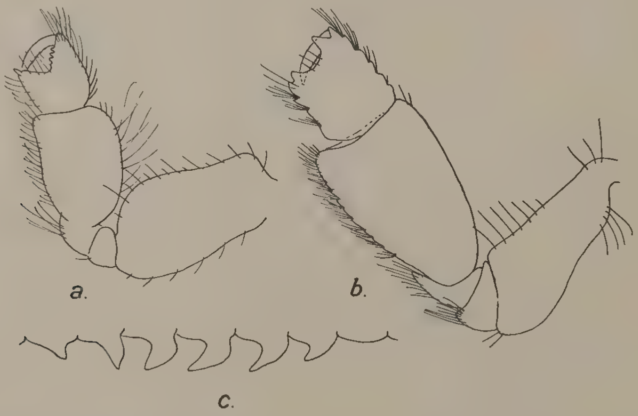

Fig. 137. *Lemboides afer*, Stebb. *a*. Gnathopod 2 ♂. *b*. Gnathopod 1 ♂ (both *a* and *b* viewed from outside). *c*. Ventral processes of ♂ (peraeon segment 1 on left).

Remarks. This species has only been reported once since its original description in 1895. The present specimens are so like Stebbing's figures as to leave no doubt of the identification. There is, however, a noticeable difference in the shape of the 6th joint of gnathopod 2 in the ♂. There is no mention in Stebbing's description of the ventral processes in the ♂. If they were indeed present in the specimen dissected, they could scarcely have escaped being observed. These processes are present on peraeon segments 2–6 inclusive, and there is a blunt tubercle-like process on peraeon segment 1.

In this latter respect there is thus a strong likeness between *afer* and *acanthiger*, Brnrd., though the two species are quite distinct in the gnathopods.

The gnathopods in the ♀ also resemble Stebbing's figures; the flask-like shape of the 5th joint in gnathopod 2 being very noticeable.

Distribution. Cape of Good Hope (Stebbing); Simons Bay.

Family PHOTIDAE

Stebbing, 1906, pp. 603, 737; 1910, p. 608.

Genus **Photis**, Kröy.

Stebbing, 1906, pp. 605, 738; 1910, p. 608.
Schellenberg, 1925, p. 170.

Photis uncinata, n.sp. (Fig. 138).

Barnard, 1916, p. 243, pl. xxviii, fig. 26 (*longicaudata*, *non* Bate and Westw.).

Occurrence: St. 91. South Africa. Many mostly ovig. ♀♀, 6–7 mm.

Description. The description of this South African form is given in the above reference, where I identified it with *longicaudata*, B. and W. I now think it would be advisable to separate it as a distinct species. The present specimens show very well the curved acute process on the antero-distal angle of the 2nd joint of gnathopods 1 and 2; a feature which I overlooked in 1916.

Gnathopod 1, the palm is feebly defined and has a spine near the angle, the margin feebly crenulate. Gnathopod 2, the palm has a series of tiny nodulose points, otherwise as in the original description.

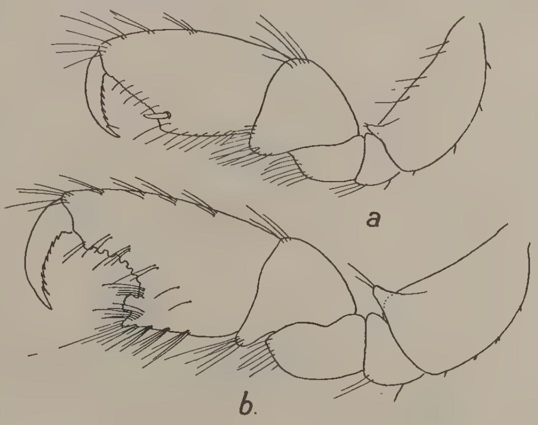

Fig. 138. *Photis uncinata*, n.sp. *a*. Gnathopod 1 ♂. *b*. Gnathopod 2 ♂.

Remarks. The character of the palm of gnathopods 1 and 2 in conjunction with the unciform projection on lower angle of 2nd joint certainly seem to warrant specific rank, though the relationship with *reinhardi* (to which the Ceylon form seems referable) is obviously close. The 1st gnathopod resembles most nearly that of *africana*, Schell., but apparently in the latter the 2nd joint of both gnathopods has neither process nor lobe, and the hand of gnathopod 2 is different.

DISTRIBUTION. Southern coast of South Africa to Natal, 25–47 fathoms.

Genus **Eurystheus**, Bate.

Stebbing, 1906, pp. 610, 738; 1910, p. 613.
Barnard, 1916, p. 249; 1925, p. 361; 1930, p. 391.
Tattersall, 1922, p. 10.
Schellenberg, 1925, p. 176; 1926, p. 375; 1931, p. 236.

There seems to be a never-ending influx of forms in this genus as each fresh expedition brings home its captures. Undoubtedly the simplest way to deal with these forms is to give specific names to each, rather than to assume local variability on the part of one and the same "species".

Eurystheus dimorphus, n.sp. (Fig. 139).

Occurrence: 1. St. 45. South Georgia. 1 immat. ♂ 13 mm., 1 immat. ♀ 15 mm., 1 ovig. ♀ 22 mm.
2. St. 123. South Georgia. 7 ♀♀ 16–19 mm.
3. St. 140. South Georgia. 4 immat. ♂♂ 14–15 mm., 11 ♀♀ 14–18 mm.
4. St. 144. South Georgia. 1 ♀ 15 mm.
5. St. 148. South Georgia. 1 immat. ♂ 15 mm., 4 ♀♀ 12–15 mm.
6. St. 149. South Georgia. 4 ♂♂ 18–24 mm., 4 ♀♀ 18–24 mm. *Types.*
7. St. 154. South Georgia. 1 ♀ 18 mm.

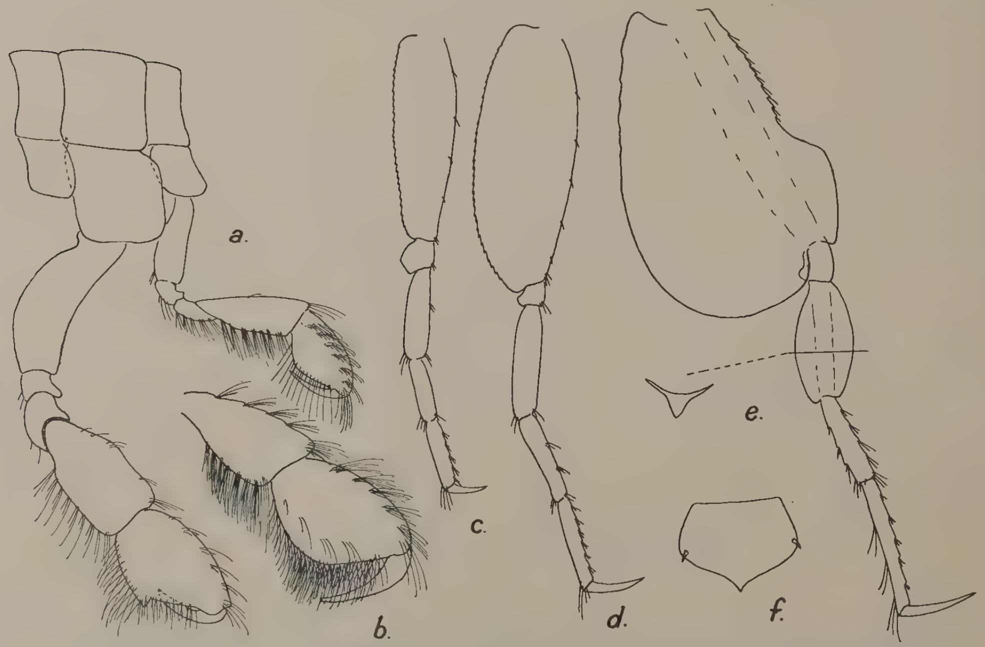

Fig. 139. *Eurystheus dimorphus*, n.sp. *a*. Peraeon segments 1–3, with side-plates and gnathopods 1 and 2 ♂. *b*. Gnathopod 2 ♀. *c*, *d*, *e*. Peraeopods 3, 4, 5 respectively, ♂, with cross-section of 4th joint of peraeopod 5. *f*. Telson.

DESCRIPTION. Rostrum obsolete. Ocular angle of head subacute, post-antennal angle acute but not prominent. Eyes obliquely oval. Peraeon segment 2 in ♂ twice as long as segment 1, and equal to segment 6. Peraeon and pleon dorsally smooth, except for three to four denticles on hind margin of pleon segments 4 and 5 dorso-laterally. Side-plate 1 quadrangular, not produced forwards, 2 larger than either 1, 3 or 4, especially in ♂, 3 and 4 quadrangular, scarcely deeper than long, shallower than 2 in both sexes. Postero-inferior angle of pleon segment 2 narrowly, of segment 3 broadly, rounded, both feebly crenulate. Telson subtriangular, broader than long, apex subacute, a spine on each lateral angle, which is rounded.

Antenna 1 extending back to end of peraeon or 1st pleon segment, 1st and 3rd joints subequal and longer than 2nd, flagellum at least as long as peduncle, 27–32-jointed, accessory flagellum 7–8-jointed. Antenna 2 shorter than antenna 1, 4th joint longest, flagellum subequal to 5th peduncular joint, 12–14-jointed.

Epistome with a long slender spine extending forward almost to apex of 3rd peduncular joint of antenna 2. Mouth-parts normal.

Gnathopod 1, 6th joint oval, shorter than 5th, palm oblique, smooth, not defined from lower margin, both joints setose, especially on lower margins, finger closing against margin of palm; no sexual differences. Gnathopod 2 in ♂ very strong and robust, 2nd joint not or only feebly channelled in front, distal anterior angles not produced in lobes, 6th subequal to 5th, palm oblique, smooth, defined by a notch which is formed by the bending inwards of the distal part of lower margin to form a flange, finger shorter than palm, stout, closing on to inner surface of hand, 5th and 6th joints setose, especially on lower margins. In ♀ considerably less stout than in ♂, similar to gnathopod 1, but longer and stronger, finger closing against margin of palm which is not defined from lower margin. In both sexes the distal half (i.e. from 4th joint onwards) of gnathopod 2 is curved inwards across the body.

Peraeopods 1 and 2 slender, feebly setose, finger just under half length of 6th joint. Peraeopods 3–5 increasing in length; peraeopod 3 similar in both sexes, 2nd joint slender, tapering distally, hind margin serrulate, postero-inferior angle rounded, dactyl half length of 6th joint. Peraeopod 4 in ♂, 2nd joint narrow, oval, greater width in centre, hind margin serrulate, postero-inferior angle rounded, dactyl half length of 6th joint; in ♀, 2nd joint similar in shape to that of peraeopod 3, though longer.

Peraeopod 5 in ♂, 2nd and 4th joints laminately expanded, 2nd joint expanded on distal half of anterior margin, proximal half spinulose, distal half smooth, hind margin strongly expanded, greatest width in distal half, feebly serrulate, lower margin broadly rounded, 4th joint ovate, expanded on both anterior and posterior margins, in cross-section triquetral, dactyl slightly more than half length of 6th; in ♀, 2nd joint similar to those of peraeopods 3 and 4, though longer, i.e. tapering distally, the greatest width being proximally, 4th joint linear as in the other peraeopods. In immature ♂ the 2nd joint is elongate-oval, like that of the 4th peraeopod, but slightly longer.

Uropods 2 and 3 extending slightly beyond uropod 1, no sexual differences in any of them. Uropod 1, upper margin of peduncle strongly spinulose, a strong spine on lower margin of apex between the rami, rami acuminate, spinulose on upper margins. Uropods 2 and 3 similar to uropod 1, but without the strong spine on apex of peduncle; rami subequal to peduncle.

Colour (as preserved); ground colour whitish, with purple patches on head, peraeon and pleon, side-plates, and 2nd joints of peraeopods 3–5, the patches on the body more or less in the form of transverse bands. Colour of no. 1 is given as "very pale yellow blotched and mottled with brown, eyes pale grey".

Remarks. This extraordinary species may remain in the genus *Eurystheus*. Its general appearance is that of a species of this genus, though sexual dimorphism has been carried to an extent found in no other species. The 2nd side-plate resembles that of *Megamphopus cornutus* (Sars, 1895, pl. xx).

Eurystheus purpurescens, n.sp. (Fig. 140).

Occurrence: 1. St. 39. South Georgia. 1 ♂ 9 mm., 1 ♀ 11 mm., 1 immat. ♀ 8 mm.
2. St. 167. South Orkneys. 2 ♂♂ 20 mm. *Type* ♂.
3. St. 190. Palmer Archipelago (90–130 m.). 1 ovig. ♀ 8 mm. *Type* ♀.

Description. In general appearance and coloration similar to *dimorphus*, but eye slightly larger, post-antennal angle of head quadrate, 2nd peraeon segment only half as long again as segment 1, and no denticles on any of the pleon segments. Telson with an apical spinule as well as one on each lateral corner in ♂, only the lateral ones in ♀.

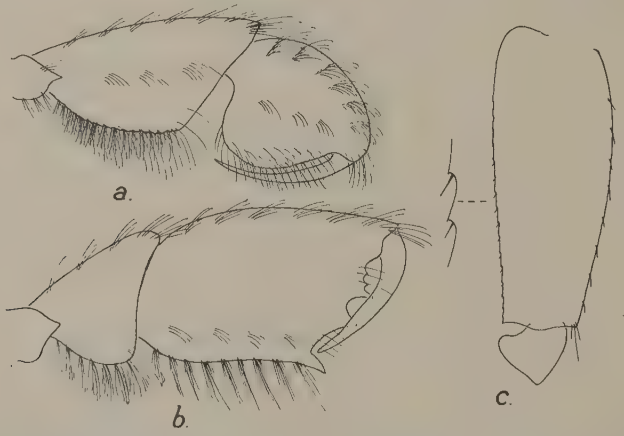

Fig. 140. *Eurystheus purpurescens*, n.sp. *a*, *b*. Gnathopods 1 and 2 (both viewed from inside). *c*. 2nd joint of peraeopod 5, with hind margin further enlarged.

Epistomial spine strong, moderately long.

Antenna 1, flagellum in ♂ 39-jointed, accessory flagellum 8-jointed. Antenna 2, flagellum in ♂ 27-jointed. In ♀ flagella of both antennae 15-jointed, accessory flagellum 6-jointed. In ♂ of no. 1 flagellum of antenna 1 16–17-jointed, accessory flagellum 5-jointed, of antenna 2 15-jointed; in the ♀ of no. 1 the numbers are respectively 14, 4 and 14.

Gnathopod 1, 6th joint subcircular, shorter than 5th, palm forming a prominent rounded angle with hind margin; alike in both sexes. Gnathopod 2, 2nd joint shallowly channelled, distal angles not produced in lobes, 5th subtriangular, shorter in ♂ than in ♀, 6th in ♂ oblong, widening slightly distally, its breadth subequal to length of 5th, palm slightly oblique, shorter than hind margin, defined by a strong tooth which is not bent inwards, with two strong teeth, the lower triangular, the upper more quadrate, with a subsidiary denticle nearer the hinge, finger strong, closing on to palmar margin but on the inside of the two teeth; in ♀ less robust, palm more oblique and the palmar teeth less strong.

Peraeopods 3–5, 2nd joint elongate, narrow-oblong, front and hind margins subparallel, but converging slightly distally, hind margin serrulate, postero-inferior angle quadrate. Peraeopods 4 and 5 subequal in length.

Remarks. Although in the form of the hand of gnathopod 2 this species approaches *longicornis*, Wlkr., *triodon*, Schell., and *trigonurus*, Schell., the length of the 5th joint at once distinguishes it, apart from other characters. The 2nd joint of peraeopod 3 also distinguishes it from *longicornis*. The similarity of the gnathopods in all the specimens induces me to consider them the same species, in spite of the difference in size between the ♂♂ and the ♀♀. The large ♂♂ of no. 2 look at first sight very like immature ♂♂ of *dimorphus*.

Eurystheus distichon, Brnrd. (Fig. 141).

Barnard, 1930, p. 391, fig. 50 (♂).

Occurrence: 1. St. 42. South Georgia. 2 ♀♀ 10–11 mm.
2. St. 45. South Georgia. 20 ♂♂ 9–12 mm., 27 ♀♀ 8–10 mm., 6 immat. 6–8 mm.
3. St. 123. South Georgia. 5 ♂♂ 8–10 mm., 4 ♀♀ 9–10 mm.
4. St. 144. South Georgia. 1 ♂ 11 mm.
5. St. 159. South Georgia. 2 ♂♂ 11–12 mm., 2 ♀♀ 12 mm.
6. St. 160. Shag Rocks. 1 ♀ 12 mm.

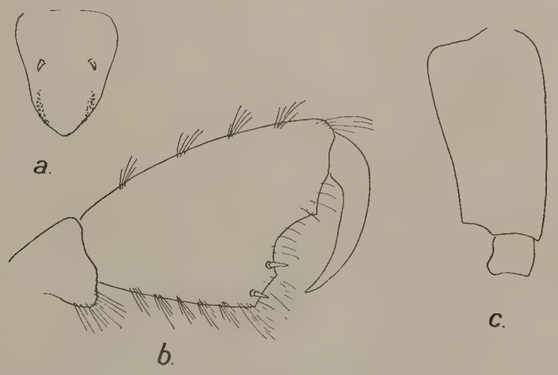

Fig. 141. *Eurystheus distichon*, Brnrd. *a*. Telson. *b*. Gnathopod 2 ♀. *c*. 2nd joint of peraeopod 5.

Description of ♀. Resembling the ♂ except that the notch on the palm of gnathopod 2 is shallower, and the 2nd joint of peraeopod 3 is less concave on the hind margin and lacks the marginal corrugations; the telson has two spines as well as the two bands of spinules.

REMARKS. The two spines on the telson are also present in the ♂; I find on re-examination of the slide of the type specimen that they were there, but being much smaller than in the present specimens were overlooked. The postero-inferior angle of pleon segment 3 is more rounded-quadrate than merely rounded. The 2nd joint of gnathopod 2 is shallowly channelled in front, and the keels not prominently lobed distally.

The colour of no. 1 was noted as being "deep canary-yellow above, paler at the sides", and that of no. 2 as "entire body very bright canary-yellow, appendages pale yellow, eyes black".

DISTRIBUTION. Off Cape Adare, 82–92 m.

Eurystheus serricrus, n.sp. (Fig. 142).

Occurrence: 1. St. 123. South Georgia. 1 ♂ 10 mm.
2. St. 140. South Georgia. 2 ♀♀ 8 and 11·5 mm., the larger ovig. *Type* ♀.
3. St. 170. South Shetlands. 3 ♂♂ 12 mm. *Type* ♂.

DESCRIPTION. Rostrum obsolete. Eyes oval-reniform. Ocular angle of head shortly acute, post-antennal angle quadrate. Peraeon and pleon smooth, except for a small subdorsal denticle on either side on pleon segments 4 and 5, better developed in ♂ than in ♀; on inner side of each denticle a small seta. Side-plates 1–4 not serrate, 2 longer than deep in ♂, about as deep as long in ♀. Postero-inferior angle of pleon segment 2 rounded-quadrate, of 3 rounded with a slight indent above the corner (cf. Schellenberg, 1926, fig. 62). Telson pentagonal, dorsal surface concave, lateral angles strongly raised

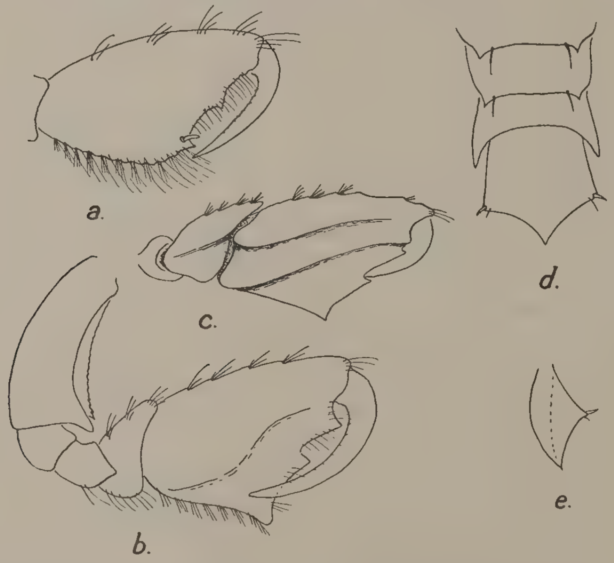

Fig. 142. *Eurystheus serricrus*, n.sp. *a*. Gnathopod 2 ♀. *b*. Gnathopod 2 ♂ (inner view). *c*. Gnathopod 2 ♂ (outer side, viewed obliquely from above). *d*. Pleon segments 4–6 and telson. *e*. Lateral view of telson (dotted line indicates level of median line).

above the level of the middle line, each with a spine and a setule, distal margins concave, sloping to the sharply acute apex.

Antenna 1, 3rd joint longer than 1st, flagellum about 18-jointed, accessory flagellum 6-jointed. Antenna 2 subequal to antenna 1, flagellum 12–16-jointed. Epistome with a strong spiniform projection. Third joint of mandibular palp large, oval, laminate, longer and broader than 2nd joint.

Gnathopod 1, 6th joint slightly shorter than 5th, both broadly expanded (cf. *purpurescens*, but 6th not so strongly expanded). Gnathopod 2, stout, especially in ♂, 2nd joint strongly channelled in front, both keels ending distally in projecting lobes, especially the inner one, the outer one in ♂ irregularly serrate, in ♀ very obscurely serrulate, 5th joint short, triangular, cup-shaped, 5th and 6th very heavy in ♂, broad dorsally (anteriorly) with the surface distinctly flattened, the inner and outer margins forming low ridges, the inner with groups of spinules, the outer smooth, 6th joint broad, widening distally to the somewhat oblique palm which is subequal to the hind margin, defined by a strong tooth with two triangular teeth separated by a notch, the tooth nearer the hinge being the larger, finger closing on to inner surface; in ♀ 5th and 6th joints rounded not flattened on dorsal margin, palm oblique, minutely crenulate, with one small tooth about in middle, and another, with a stout spine, forming a defining angle, below which the margin curves downwards before passing into hind margin.

Peraeopods 3–5, 2nd joint elongate oblong (cf. *purpurescens*), hind margin serrulate, lower hind angle rounded in peraeopod 3, quadrate in peraeopods 4 and 5.

Uropod 3, upper outer margin of peduncle spinose, three stout spines on distal margin at bases of rami.

Colour (as preserved), pale yellowish-white, eyes brownish. In the ♀♀ and in the ♂ from St. 123 there are indications of a series of brownish spots laterally at the junctions of each pair of peraeon and pleon segments.

REMARKS. At first sight somewhat resembling *distichon*, which is also uniformly pale-coloured; but easily distinguished by the telson and other features. The flattened upper surface of the 5th and 6th joints of gnathopod 2 is noteworthy.

Although the two sexes were not found together, the complete agreement, except in the secondary sexual characters, makes it certain that they are conspecific. Moreover, nos. 1 and 2 are both from the South Georgia area.

Eurystheus remipes, n.sp. (Fig. 143).

Chilton, 1912, p. 510, pl. ii, figs. 30–34 (*afer*, *non* Stebb.); 1920, p. 7 (*dentatus*, *non* Chevr.).

Occurrence: St. 51. Falklands. 1 ♂ 6 mm.

DESCRIPTION OF ♂. Eyes broadly oval, oblique. Ocular angle of head rounded, post-antennal angle acute but not prominent. Peraeon and pleon dorsally smooth. Side-plate 1 oblong, not produced forwards, setulose but not dentate, 2 much larger. Postero-inferior angle of pleon segment 3 rounded, with a small subapical notch on lower margin. Telson transverse, apex rounded, a strong spine on each lateral angle.

Antenna 1, 3rd joint longer than 1st, flagellum 10–11-jointed, accessory flagellum 4-jointed. Antenna 2, flagellum 10–11-jointed. Epistomial spine strong.

Gnathopod 1, 6th joint shorter than 5th, oval, longer than broad, palm oblique, not defined from hind margin, 5th and 6th joints both setose. Gnathopod 2 long, carried transversely across the body, 2nd joint linear, 6th shorter than 5th, ovate, palm very oblique, defined by a small tooth from the short hind margin, with three small rounded denticles, finger shorter than palm, 5th and 6th joints setose.

Peraeopods 1 and 2 slender, feebly setose, dactyl half length of 6th joint. Peraeopod 3, 2nd joint large, oblong, expanded behind, hind margin very slightly concave, serrulate, lower hind angle rounded, 4th strongly expanded, almost circular, 5th and 6th slender. Peraeopod 4 resembling peraeopod 3, but hind margin of 2nd joint gently convex and 4th joint oval, not quite so strongly expanded. Peraeopod 5, 2nd joints slender, widest proximally, tapering distally, hind margin undulate, entire, with only a few setules, 4th linear.

Uropod 3 slender, peduncle with two stout spines on distal margin.

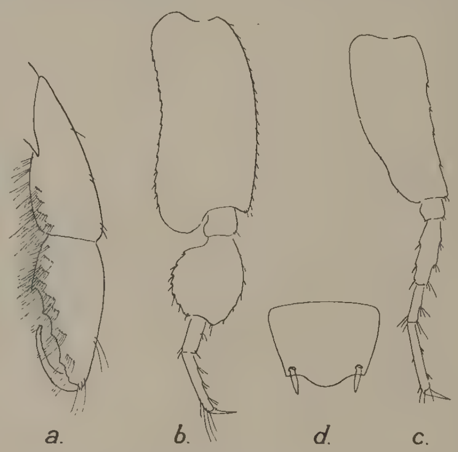

Fig. 143. *Eurystheus remipes*, n.sp. *a*. Gnathopod 2 ♂. *b*, *c*. Peraeopods 3 and 5. *d*. Telson.

REMARKS. Chilton (1912) has described and figured a ♂ and a ♀ from Gough Island which resemble the present specimen very closely. The 2nd gnathopod in the two ♂♂ is similar, and both specimens have the expanded 4th joint in the posterior peraeopods; but whereas in Chilton's specimen the expansion occurred on peraeopods 3 and 5, here it occurs on 3 and 4.

In 1920 Chilton came to the conclusion that the Gough Island specimens were more properly identified as *dentatus*, Chevr., than as *afer*, Stebb. He states that specimens from New Zealand are the same as those from Gough Island and that the 1st side-plate and the pleon segments in the New Zealand specimens are dentate as in *dentatus*; but the gnathopods are more elongate and slender. Other examples, however, from the Kermadec Islands resembled Chevreux's figures in this respect. The following five characters are tabulated for *dentatus* and the specimens from the respective localities.

	E. dentatus	Gough Island	New Zealand	Kermadec Islands	Falkland Islands
Pleon segments	Dentate	? Dentate	Dentate	Dentate	Smooth
Side-plate 1	Dentate	? Dentate	Dentate	Dentate	Smooth
Gn. 2 ♂ hand	Not very slender	Slender	Slender	Not very slender	Slender
Palm	Oblique, bidentate	Very oblique, bidentate (? tridentate)	?	?	Very oblique, tridentate
Gn. 2 ♂ 5th joint	Short	Elongate	?	?	Elongate

The position is obviously unsatisfactory and Chilton's arguments inconclusive. One may, however, with some degree of certainty claim that the Gough Island and Falkland Islands specimens are the same species, and that they are not the same as *dentatus*. I think that in all probability there were three denticles, excluding the one at the defining angle, on the palm of gnathopod 2 in the Gough Island specimen, though Chilton described and figured only two. Chilton in 1912 made no mention of side-plate 1 or the pleon segments being dentate, and in fact referred the specimens (with hesitation) to *afer* in which these parts are not dentate. Therefore I feel justified in assuming that in 1920 the Gough Island specimens were not actually re-examined by Chilton, and that his statement of their similarity to the New Zealand form was based on the gnathopods. There still remains, however, the unaccountable difference in the 5th joint of gnathopod 2 in ♂.

A new name for the Scotia and Discovery specimens seems desirable.

DISTRIBUTION. Gough Island.

Eurystheus palmoides, n.sp. (Fig. 144).

Occurrence: St. 91. South Africa. 3 ♂♂ 3·5 mm.

DESCRIPTION. Closely resembling *palmatus*, but differing in the 2nd gnathopod, viz. 2nd joint channelled in front, each keel ending distally in a small projecting lobe, 6th joint ovate, palm evenly convex, extending almost to base of joint where it is defined by two small spines, finger much shorter than palm, strongly curved and closing against inner surface of hand. Epistomial spine well developed.

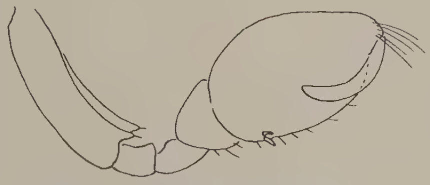

Fig. 144. *Eurystheus palmoides*, n.sp. Gnathopod 2 ♂.

Second joints of peraeopods 3–5 as in *palmatus*, that of peraeopod 3 the most, that of peraeopod 5 the least expanded.

No dorsal denticles. Eyes obliquely oval. Postero-inferior angle of pleon segment 3 rounded-quadrate.

Eurystheus eurypodii, n.sp. (Fig. 145).

Monod, 1926, p. 60, fig. 57 (figures only).

Occurrence: St. 55. Falklands. 3 ♂♂ 3 mm., 2 ovig. ♀♀ 3·5 mm. from *Eurypodius*.

DESCRIPTION. Eyes broadly oval. Antero-lateral angle of head acute. Side-plates 1–4 as deep as, or even slightly deeper than, their segments; 1 not produced forwards, 1 and 2 rounded below. Pleon dorsally smooth. Postero-inferior angle of pleon segment 3 rounded-quadrate. Telson rounded-triangular, with two setae on upper surface.

Antenna 1, flagellum 7-jointed, accessory flagellum 2-jointed. Antenna 2, flagellum 7–8-jointed. Epistomial spine well developed.

Gnathopod 1, 5th joint moderately long, its width equal to width of 2nd joint, 6th scarcely as long as 5th, wider, oval, palm oblique, continuous with hind margin, but defined by a spine, finger overlapping palm. Gnathopod 2 in ♂, 2nd joint stout and rather short, 5th triangular, 6th a little wider and much longer than 5th, oblong, palm transverse, divided into two portions by a step, the lower portion minutely crenulate or castellate, defining angle rounded, finger equal to palm, inner margin minutely crenulate; in ♀ similar but weaker.

Peraeopod 3, 2nd joint broadly expanded, anterior margin strongly convex. Peraeopods 4 and 5, 2nd joint pyriform, narrower in peraeopod 4 than in 5.

Colour (as preserved), white with greyish mottling, eyes black.

Remarks. This little species approaches *Megamphopus* in the reduced accessory flagellum, but is a typical *Eurystheus* in the epistomial spine and 2nd gnathopod. There is no doubt that this is the same species which Monod partly figured. The Belgica specimens were also taken on the carapace of *Eurypodius*.

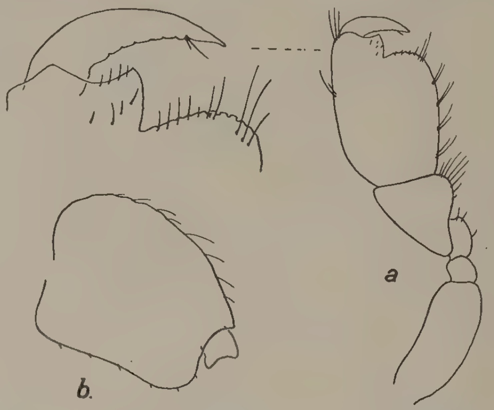

Fig. 145. *Eurystheus eurypodii*, n.sp. *a*. Gnathopod 2 ♂, with palm and finger further enlarged. *b*. 2nd joint of peraeopod 3.

Distribution. Magellan Strait.

Genus **Megamphopus**, Norm.

Stebbing, 1906, p. 621.
Chevreux and Fage, 1925, p. 318.
Schellenberg, 1925, p. 182.

It is a little difficult to define the exact differences between *Eurystheus* and this genus. The epistomial spine is characteristic of many species of *Eurystheus*, though apparently not so strongly developed in the type species, *maculatus*, as in other species. It is not developed at all in *Megamphopus*. The accessory flagellum of antenna 1 in *Eurystheus* is usually multiarticulate (four to ten joints), but in *palmatus* is reduced to two to three joints, and forms a transition to *Megamphopus* where it has only a single joint.

In the species of *Eurystheus* the 5th joint of gnathopod 2 in the ♂ shows all stages from the triangular or cup-shaped form to the elongate form where the joint is as long as or even longer than the 6th joint, thus also connecting with *Megamphopus*. The hand of gnathopod 2 in the ♂ is, however, usually strong in *Eurystheus*, and the palm always better developed than in *Megamphopus*.

The species described below is placed in *Megamphopus* on account of the reduced accessory flagellum, the absence of an epistomial spine, and the feebly developed palm of gnathopod 2 in the ♂.

Two species of this genus are known, one from Northern Europe, the other from the coast of Algeria.

Megamphopus blaisus, n.sp. (Fig. 146).

Occurrence: 1. St. 123. South Georgia. 3 immat. ♂♂ 5·5–6 mm., 1 ♀ 6 mm.
2. St. 140. South Georgia. 2 ♂♂ 6·5–7 mm., 1 ♀ 7 mm.
3. St. 141. South Georgia. 1 immat. ♂ 6·5 mm., 1 ovig. ♀ 7 mm.
4. St. 144. South Georgia. 2 ♀♀ 6–7 mm., 2 immat. ♂♂ 4·5–6 mm., 1 ♀ 6 mm. *Types.*

DESCRIPTION. Antero-lateral angles of head acute, occupied by the well-developed oval eyes. Side-plate 1 slightly produced forwards, but antero-inferior angle rounded; 2 larger than the others in ♂, longer than deep; 3 and 4 deeper than long, about as deep as their segments; 5 with anterior lobe much deeper than posterior lobe. Pleon dorsally smooth; postero-inferior angle of segment 3 rounded. Telson rounded-triangular, about as broad as long, with two spinules on dorsal surface, each flanked on outside by a seta.

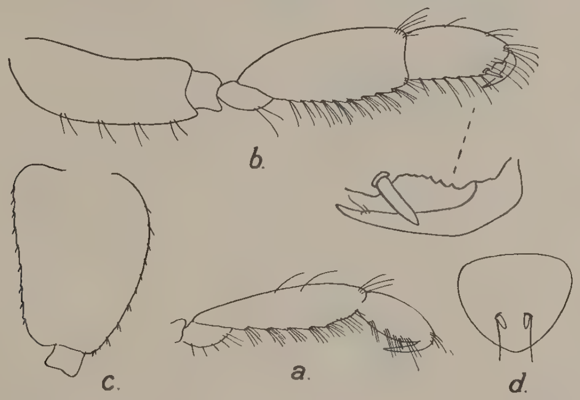

Fig. 146. *Megamphopus blaisus*, n.sp. *a*. Gnathopod 1 ♂. *b*. Gnathopod 2 ♂, with palm and finger further enlarged. *c*. 2nd joint of peraeopod 3. *d*. Telson.

Antenna 1, 3rd joint subequal to 1st, flagellum 12–14-jointed, accessory flagellum as long as 1st flagellar joint, 1–2-jointed, with a minute terminal joint. Antenna 2 about as long as antenna 1, flagellum 12-jointed. Epistome without spinous projection. Third joint of mandibular palp shorter than 2nd, but not so shortened as in *cornutus* (Sars, pl. cc).

Gnathopod 1, 5th joint elongate, lower margin undulate, with oblique marginal rows of long setae, 6th shorter than 5th, ovate, palm shorter than hind margin but undefined except by a slender spine, finger overlapping palm. Gnathopod 2 in the ♂ strongly developed, folded transversely across the body, 2nd joint stout, 5th nearly as long as 2nd, with fascicles of long setae on lower margin, 6th shorter than 5th, oblong, lower margin with fascicles of long setae, palm very short, oblique, concave, defined by a strong spine, margin adjoining hinge minutely crenulate, finger overlapping palm; in ♀ similar but much feebler and not folded inwards across the body.

Peraeopods 3–5 increasing in length, 2nd joint pyriform, broadest in peraeopod 3, narrowest in peraeopod 5, anterior margin spinulose, posterior margins feebly notched and spinulose.

Uropod 3, peduncle stout, one spine on upper inner apex and two spines on upper surface between bases of rami, outer ramus almost as long as peduncle, inner ramus shorter.

Colour (as preserved), white with greyish markings, the most conspicuous of which form a row of spots on the side-plates and on the pleura of pleon segments 1–3, an ocellate mark laterally on each peraeon segment, and a medio-dorsal spot from peraeon segment 3 or 4 to pleon segment 4, eyes grey or pinkish.

REMARKS. This species is distinguished from *cornutus* and *longicornis* by the size of the 5th joint of gnathopod 2 in the ♂. The specific name refers to the infolding of the 2nd gnathopods across the body in the ♂, a feature which is also found in e.g. *Eurystheus dimorphus* and *Aora typica*.

Genus **Podoceropsis**, Boeck.

Stebbing, 1906, p. 618.
Schellenberg, 1925, p. 181.

Podoceropsis elephantis, n.sp. (Fig. 147).

Occurrence: St. 170. South Shetlands. 1 ♂ 8 mm.

DESCRIPTION OF ♂. Eyes oval, pale reddish. Ocular angle of head acute, post-antennal angle quadrate. Peraeon and pleon smooth. Side-plate 1 oblong, deeper than long, 2 longer than deep, 3 and 4 deeper than 2. Postero-inferior angle of pleon segments 2 and 3 rounded. Telson triangular, longer than basal width, apex subacute, a subapical group of four setae.

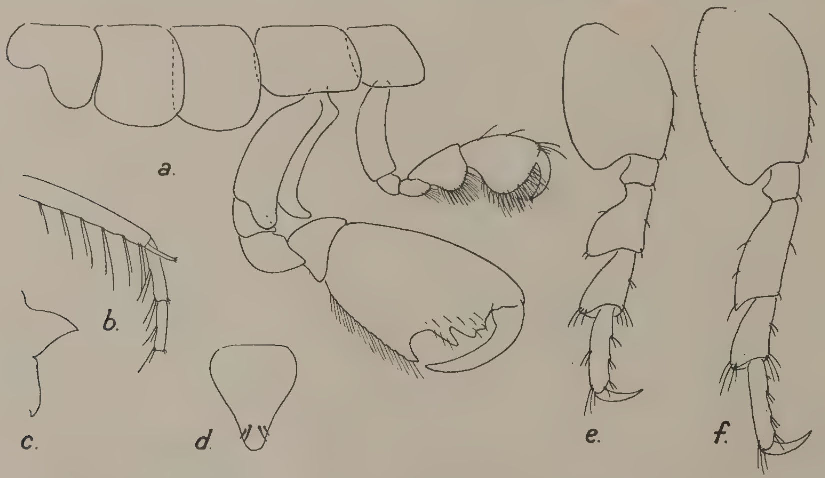

Fig. 147. *Podoceropsis elephantis*, n.sp. *a*. Side-plates 1–5, with gnathopods 1 and 2 ♂. *b*. Portion of antenna 1. *c*. Profile of epistome and upper lip. *d*. Telson. *e*, *f*. Peraeopods 3 and 5.

Antenna 1, 3rd joint slightly longer than 1st, flagellum scarcely longer than 3rd joint, 8-jointed, a minute slender 1-jointed accessory flagellum tipped with two setules. Antenna 2 a little longer than antenna 1, flagellum slightly shorter than 5th peduncular joint, 4–5-jointed.

Epistome with a projecting triangular lamina (not spiniform).

Gnathopod 1, 6th joint longer than 5th, both strongly lobed on lower margin. Gnathopod 2, 2nd joint very stout, deeply channelled in front, both keels distally forming prominent lobes, the outer broader than inner, 5th short, cup-shaped, 6th large, oblong, palm slightly oblique, defined by a strong tooth, followed by a deep notch, and then two teeth close together, one narrow, the other squarish, notched, finger stout.

Peraeopods 1 and 2 stout. Peraeopods 3–5 stout, 2nd joint oval, longer and narrower in peraeopod 5 than in peraeopod 3, intermediate in peraeopod 4, hind margin entire, with indications of crenulation in peraeopod 5, lower hind angle rounded, 4th and 5th joints expanded, stout, especially in peraeopod 3.

REMARKS. The specific name refers to the stout limbs, especially the 2nd joint of gnathopod 2, and also to the locality, Elephant Island, near which the specimen was caught.

Genus **Haplocheira**, Hasw.

Stebbing, 1906, p. 609.

Haplocheira barbimanus (Thoms.).

Stebbing, 1906, p. 609, figs. 104, 105.
Walker, 1907, p. 35.
Chilton, 1912, p. 510.
Barnard, 1930, p. 391.

Occurrence: 1. St. 140. South Georgia. 2 ♂♂ 5·5 mm., 4 ♀♀ 5·5–6 mm.
2. St. 141. South Georgia. 1 ovig. ♀ 8·5 mm.
3. St. 144. South Georgia. 5 ♀♀ 6–8 mm.
4. St. WS 25. South Georgia. 6 ♀♀ 7–9 mm.
5. St. WS 33. South Georgia. 5 ♀♀ 5·5–6 mm.

REMARKS. Head with antero-lateral angle angular, but not sharply pointed as in Stebbing's figure of *plumosa* (1888, pl. cxxvi). Pleon segment 4 with two small dorso-lateral denticles on hind margin as noted by Walker (1907). Peduncles of pleopods with small projection on inner apex.

At the present time one cannot do otherwise than refer these specimens to Thomson's species. A thorough critical comparison with Australasian specimens may show that there are differences of specific value (cf. Stephensen, 1927, p. 352).

DISTRIBUTION (Antarctic). McMurdo Sound; South Orkneys. ? Falkland Islands.

Haplocheira robusta, n.sp. (Fig. 148).

? Stebbing, 1914, p. 370 (*barbimanus*, ? *non* Thoms.).

Occurrence: 1. St. 53. Falklands. 1 ♂ 8·5 mm., 5 ♀♀ (2 ovig.) 8–10 mm., 8 juv. 4·5–5·5 mm. *Types*.
2. St. 54. Falklands. 3 ♀♀ (2 ovig.) 6·5 mm.
3. St. 58. Falklands. 3 ♀♀ (2 ovig.) 7 mm.
4. St. WS 71. Falklands. 1 ♀ 6 mm.
5. St. WS 85. Falklands. 1 ♂ 8 mm., 4 ♀♀ 6–10 mm. (one of the largest ovig.).
6. St. WS 86. Between Falklands and South America. 1 ovig. ♀ 8·5 mm.

Description. More robust than *barbimanus*, the antennae, gnathopods, peraeopods and uropods all much more robust than in *barbimanus*. Antero-lateral angle of head rounded, or at most very obtusely angular. Denticles on pleon segment 4 obsolete.

Antenna 1 extending back to end of peraeon segment 2 or very slightly beyond (in *barbimanus* as far as end of 4th segment). Antenna 2 stout, *Corophium*-like, scarcely as long as antenna 1.

Gnathopod 1, 6th joint with a very short but distinct transverse palm with a spine at its angle; cf. Chilton's figure of *lendenfeldi*, but finger is here proportionately shorter. Gnathopod 2, as in Chilton's figure of *lendenfeldi* (1884, *Trans. N.Z. Inst.*, xvi, p. 262, pl. xx, figs. 1 *a–e*).

Peraeopods 1 and 2, also as in *lendenfeldi*. The 4th joint is more strongly expanded than in Stebbing's figure of *plumosa* (1888, pl. cxxvi). Peraeopod 3, 2nd joint broadly expanded, basal width as great as length, 3rd very wide and very short, 4th very robust, likewise the 5th and 6th, the latter with a series of 4–5 strong spines on anterior margin; thus differing markedly from Stebbing's figures of *plumosa*. Peraeopod 4 also stout, but a little longer than peraeopod 3, 2nd joint regularly oval, otherwise similar to peraeopod 3. Peraeopod 5 a little longer than peraeopod 4, 2nd joint strongly expanded on hind margin, forming a rounded lobe extending to middle of 4th joint, 5th and 6th joints with strong spines on anterior margin.

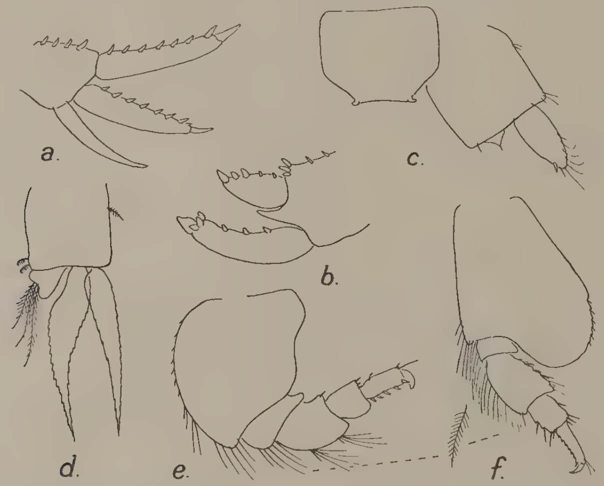

Fig. 148. *Haplocheira robusta*, n.sp. *a*. Uropod 1. *b*. Uropod 2. *c*. Telson and uropod 3. *d*. Pleopod (setae on rami omitted). *e*, *f*. Peraeopods 3 and 5.

Anterior margins of 2nd joints distally and of 3rd and 4th joints in peraeopods 3–5 with plumose setae, especially in peraeopod 5.

Pleopods with the projection on inner distal angle of peduncle much more developed than in *barbimanus*, with several plumose setae.

Uropod 1 with stronger spines than in *barbimanus*. Uropod 2, the spine at end of peduncle stout but relatively shorter than in *barbimanus*, the spines on each ramus much stouter, especially the terminal one. Uropod 3, inner ramus reduced to a minute conical projection, which does not appear to be articulated with the peduncle, tipped with one spinule.

Colour (as preserved), white speckled with greyish, the head darker, a dark mediodorsal spot on each peraeon and pleon segment, the posterior ones more prominent than the anterior ones.

Remarks. The above description points out the differential features between this form and the form referred to *barbimanus*. They may seem to be trivial. They may prove to be merely varietal. But in practice the two forms are easily distinguished and they may be separated without any reference to the respective localities.

I suspect that this species may be very closely allied to, but not identical with, Chilton's *Corophium lendenfeldi* (*loc. cit.*) which has been united with *barbimanus*, albeit without any really critical examination.

The difference between *lendenfeldi* and *robusta* lies in the 3rd to 5th peraeopods, which in the latter are even stouter than in Chilton's figure, and the 2nd joints are differently shaped. Chilton says the 3rd–5th peraeopods are "similar in form..., the basa much expanded". It is a task for some New Zealand carcinologist to rediscover *lendenfeldi* and give a more detailed description of it, and contrast it with the true *barbimanus* from which I feel sure it is distinct.

Genus **Kuphocheira**, Brnrd.

Barnard, 1931, p. 429.

Ocular angle of head not prominent, post-antennal angle obsolete. Side-plates moderate, 1st much smaller than 2nd, 4th with hind margin not excavate. Telson rounded, broader than long.

Antennae 1 and 2 short, 1st longer than 2nd, flagella shorter than peduncles, no accessory flagellum. Upper lip rounded. Lower lip broad, inner lobes almost as large as outer lobes, mandibular processes blunt. Third joint of mandibular palp shorter than 2nd. Maxilla 1, inner lobe with six setae, outer with nine spines, 2nd joint of palp moderately long. Inner lobe of maxilla 2 fringed on inner margin. Maxilliped, inner plate well developed, outer narrow, palp long.

Gnathopod 1 simple. Gnathopod 2 simple, 5th and 6th joints enlarged, more so in ♂ than ♀, very setose, finger reduced.

Peraeopods 1 and 2, 2nd joint ovate, glandular, dactyl long. Peraeopods 3–5 increasing in length, 5 much the longest, 2nd joint oval, dactyl short. Uropods 1 and 2 spinose, a strong spine on lower apex of peduncle. Uropod 3 uniramous, the ramus spinose.

Peduncle of pleopods short, stout. Branchial lamellae narrow, elongate, simple.

Remarks. Close to *Haplocheira*, but without accessory flagellum, with reduced finger on gnathopod 2, uropod 3 uniramous, and without hooks on telson.

Kuphocheira setimanus, Brnrd. (Fig. 149).

Barnard, 1931, p. 429.

Occurrence: St. 164. South Orkneys. 15 ♂♂ 3·75–4 mm., 9 ♀♀ 4 mm.

DESCRIPTION. Body rather depressed, the back broadly rounded. Rostral point minute, ocular angle rounded, almost truncate. Eyes well developed, small, oval, dark. Side-plate 1 small, shallow, produced forwards, with three setae on rounded apex; 2 much larger, also produced forwards, with setae on lower margin; 3 and 4 a trifle deeper than long, setose on lower margin; anterior lobe of 5 as deep as side-plate 4.

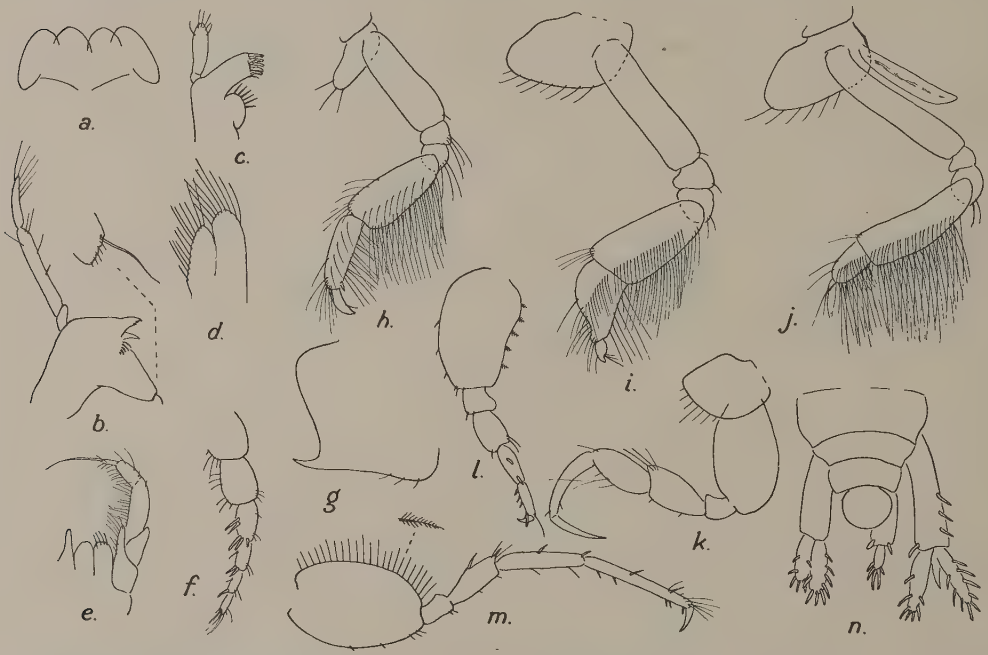

Fig. 149. *Kuphocheira setimanus*, Brnrd. *a*. Lower lip. *b*. Mandible with molar further enlarged. *c*. Maxilla 1. *d*. Maxilla 2. *e*. Maxilliped. *f*. 3rd–5th peduncular joints and flagellum of antenna 2 ♂. *g*. Pleon segment 3. *h*. Gnathopod 1. *i*. Gnathopod 2 ♂. *j*. Gnathopod 2 ♀ (*h*, *i*, *j* all viewed from inside). *k*. Peraeopod 1. *l*, *m*. Peraeopods 3 and 5. *n*. Pleon segments 4–6 and telson, with uropods 1–3.

Postero-inferior angle of segment 1 rounded, of 2 quadrate, the actual corner rounded, of 3 produced backwards in an acute point. Telson a little broader than long, evenly rounded, without hooks.

Antenna 1, flagellum 6-jointed in ♂, 5 in ♀. Antenna 2 shorter but stouter than antenna 1, especially in ♂, flagellum 3-jointed in both sexes; in ♂ stout spines on lower margin of 5th peduncular joint and first two flagellar joints; these spines absent in ♀.

Secondary cutting plate and spine row in both mandibles, molar tubercle long, apically with a few setules and one long seta, 2nd joint of palp considerably longer than 3rd. Maxilliped, palp setose, a long seta at apex of terminal joint.

Gnathopod 1 simple, alike in both sexes, 5th joint longer than 6th, both densely setose, especially in ♂, a small spine at lower distal apex of 6th, finger not quite half length of 6th joint. Gnathopod 2 simple, unlike in the two sexes; in ♂ stout, 5th joint expanded, upper and lower margins straight, diverging, 6th much shorter, subtriangular, gibbous on upper margin at base, narrowing rapidly, 5th and 6th joints densely setose, finger reduced, the unguis very short and blunt; in ♀ more slender, 5th joint slightly expanded, the lower margin gently convex, 6th short, oval, both joints densely setose, more so than in ♂ and the setae longer, finger very small.

Peraeopods 1 and 2, 2nd joint broadly oval, glandular, 4th and 5th subequal, the latter slightly narrower, oval, 6th longer, slender, dactyl two-thirds length of 6th, very slender. Peraeopods 3 and 4, 4 somewhat longer than 3, 2nd joint oval, hind margin slightly convex, with spaced, short plumose setae, 4th and 5th subequal, 6th longer, 5th with two stout spinules, 6th with 4 (–5), dactyl short, stout, unguis slightly hooked. Peraeopod 5 much longer than peraeopod 4, with more numerous setae on hind margin of 2nd joint, 5th and 6th joints more slender, otherwise similar.

Uropod 1 extending slightly beyond uropod 2; both with a stout spine on lower apex of peduncle, rami strongly spinose. Uropod 3 slightly shorter than uropod 2, uniramous, the ramus shorter than the peduncle, strongly spinose.

Colour (as preserved), pale greenish, but this may be due to the preservative, as the other specimens in the same tube, belonging to several species, were all more or less of the same tint.

Family AMPITHOIDAE

Stebbing, 1906, pp. 631, 738.

Genus **Ampithoë**, Leach.

Stebbing, 1906, pp. 631, 738.
Barnard, 1916, p. 253.

Ampithoë brevipes (Dana) (Fig. 150).

Stebbing, 1906, p. 637; 1914, p. 371.
Non Barnard, 1916, p. 255 (= *falsa*, n.sp.).

Occurrence: 1. St. 4. Tristan da Cunha. 1 ♂ 9 mm., from *Macrocystis*.
2. St. 53. Falklands. 4 ♂♂ 15–17 mm., 2 ♀♀ 16 and 19 mm., from kelp root.
3. St. 55. Falklands. 2 ♂♂ 13 and 17 mm., 1 ♀ 15 mm.
4. St. 56. Falklands. 2 ♂♂ 15 and 18 mm., 1 ovig. ♀ 19 mm.

REMARKS. The Tristan da Cunha specimen fits Bate's figure (1862) pl. xli, fig. 6 (*falklandi*) well, but being a ♂ has the 2nd gnathopod as in his figure pl. xliii, fig. 2.

Stebbing (1914) having only a ♀ specimen, was able to add nothing which might help towards a more exact definition of this species. He states that his ♀ specimen agreed with Dana's figures of *brevipes*. Dana's *peregrina* and Bate's *falklandi* were founded on ♀♀ (or juv.). Bate's figures of *brevipes* (pl. xliii, fig. 2 *i*, after Dana) and of *chilensis* (pl. xlii, fig. 5, after Nicolet) might both be considered applicable to the present specimens without undue violence to the imagination.

I give the following notes on the present specimens.

Gnathopod 1, 2nd joint distally lobed in both sexes. Gnathopod 2, 2nd joint distally lobed in both sexes. Lower margin of 6th joint in ♂ forming with the palmar ridge an even curve, but separated from it by a rounded notch; the hind margin and the palmar ridge (but not the notch) is minutely crenulate. The setae are mostly arranged in fascicles and are simple. In the younger ♂♂ there is a distinct step between the palm and the hind margin, both of which are crenulate; in other words, the long flat tooth on the palm has attained its full development. In a 17 mm. ♂ from no. 2 the palmar ridge or rectangular tooth is much shorter, not reaching the hinge, and therefore projects as a prominent flat tooth or tubercle.

Uropod 3, peduncle with three stout spines on distal margin medianly, and two near inner angle; inner ramus with a stout apical spine, and a row of four to five smaller ones nearer the outer margin.

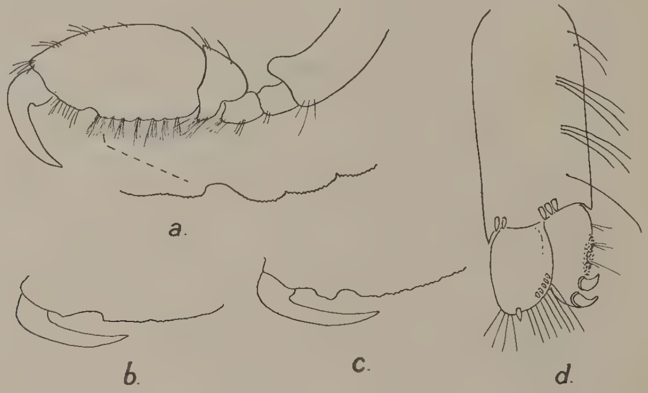

Fig. 150. *Ampithoë brevipes* (Dana). *a.* Gnathopod 2 ♂, with palm further enlarged (St. 56). *b.* Palm of gnathopod 2 of young ♂ (St. 56). *c.* Palm of gnathopod 2 of ♂ (St. 53). *d.* Uropod 3.

The colour of no. 2 is given as: "Pale green throughout, with pink eyes".

Stebbing (1906) remarks that *brevipes* is very near to *femorata.*

Comparison of these specimens with the South African ones which I identified as *brevipes* (1916) shows that they are not the same species. The absence of apical lobes on the 2nd joints of the gnathopods, the perfectly smooth lower margin of the 6th joint in gnathopod 2 of the ♂, with its plumose setae, as well as the details of the 3rd uropods serve to distinguish the South African form, which I therefore call *Ampithoë falsa*, n.sp. (Barnard, 1916, p. 255, pl. xxviii, fig. 34, *brevipes*, *non* Dana).

Distribution. Tierra del Fuego; Falkland Islands. ? Valparaiso (*peregrina*).

Ampithoë? brasiliensis (Dana).

Bate, 1862, p. 248, pl. xliii, fig. 3.
Stebbing, 1906, p. 637.

Occurrence: 1. St. 1. Ascension. Three specimens 4–4·5 mm.
2. St. 2. Ascension. Four specimens 3–5 mm.

Remarks. These small specimens belong to the genus *Ampithoë*, but it would be unwise to identify them definitely with Dana's species, which apparently is still awaiting precise diagnosis.

The 2nd gnathopod resembles that figured by Kunkel (1910, *Trans. Conn. Ac.*, xvi, p. 90, fig. 35) for *rubricata* from Bermuda. The inner lobe of maxilla 1, however, has four setae and thus conflicts with typical *rubricata*. The mandibular palp, moreover, is slender, the 3rd joint not apically expanded.

Family JASSIDAE

Stebbing, 1906, p. 647.

Genus Jassa, Leach.

Stebbing, 1906, pp. 652, 739.
Sexton, 1911, p. 212.

Remarks. That *falcata* is an almost cosmopolitan form, and also that the ♂♂ are dimorphic, appears to be true. Sexton's investigations formed the basis for this conclusion. But there is no reason why several other "species" should be included under *falcata* without at least as thorough an investigation, as e.g. *ingens*, *goniamera* and *wandeli*, and a protest against what seems rather indiscriminate lumping is not inopportune.

Chevreux has pointed out features separating *wandeli* from *falcata*, and the constancy of these features seems to be confirmed by the present material. The straight hind margin of the 2nd joints of peraeopods 3–5 was a feature specially mentioned by Pfeffer, Walker and Chevreux. This apparently was one of the differences which Chilton (1912) dismissed as being merely what one might "expect to meet in such a very large form". I do not quite see why it should be expected, and in any case I hold that it is better to keep the *ingens* form separate from the *falcata* form for the present.

The presence of small specimens, with adult ♂♂ and ovigerous ♀♀, in the Discovery collection, which are apparently typical *falcata*, leads to the question as to what are the characters of typical *falcata*. Without attempting an answer, owing to lack of material from northern waters, attention may be directed here to one character which seems to have been ignored, namely the epistome.

Sars (1895, pl. ccxii), Chevreux (1906, fig. 55), and Chevreux and Fage (1925, fig. 352) give frontal views of the epistome and upper lip, but no profiles. This defect should be remedied, and the value of the character tested for specific purposes. The forms here identified as *ingens* and *falcata*, and also South African examples attributed to *falcata*, have a rounded epistomial projection, very different from the pointed triangular process in the Tristan da Cunha specimens here referred to *pusillus*.

Jassa falcata (Mont.).

Sars, 1895, p. 594, pl. ccxii.
Stebbing, 1906, p. 654 (*pulchella*); 1914, p. 371.
Sexton, 1911, p. 212, pl. iii, fig. 10.
Schellenberg, 1926, p. 383 (part).
Barnard, 1930, p. 392.
? Monod, 1926, p. 61, fig. 58.

Occurrence: 1. St. 164. South Orkneys. 8 ♂♂ 5–7·5 mm., 7 ♀♀ (some ovig.) 5·5–7 mm., 8 juv. 4–5 mm.
2. East Cumberland Bay, South Georgia. Several ♂♂ and ♀♀ (incl. ovig. ♀♀ but no adult ♂♂) up to 8 mm.

REMARKS. Epistome as figured here for *ingens*. Antero-inferior angle of 2nd joint of peraeopods 1 and 2 rounded or bevelled. Hind margin of 2nd joints of peraeopods 3–5 convex.

Colour (as preserved): the pigment is more or less evenly distributed in distinctly separated specks, and seems better developed, or more lasting in the preservative, in the ♀ than in the ♂.

DISTRIBUTION. Almost cosmopolitan.

Jassa ingens (Pfr.) (Fig. 151 *c*).

Pfeffer, 1888, p. 131, pl. iii, fig. 1.
Walker, 1903, p. 61, pl. xi, figs. 98–107 (*goniamera*); 1907, p. 38.
Chevreux, 1906, p. 94, figs. 54–56 (*wandeli*); 1913, p. 181, fig. 61.
? Chilton, 1912, p. 511.
? Schellenberg, 1926, p. 383 (part).

Occurrence: 1. St. 170. South Shetlands. 3 ♂♂ 15–17 mm., 10 ♀♀ 17–19 mm.
2. St. 175. South Shetlands. 1 ♂ 18 mm.
3. St. 179. Palmer Archipelago. 3 ♂♂ 10–11 mm., 4 ovig. ♀♀ 9–10 mm., 1 juv. 5 mm.

REMARKS. Epistome forming proximally a projecting lamina, rounded in profile, and separated from the front part of the head by a narrow indent. Antero-inferior angle of the 2nd joint in peraeopods 1 and 2 sharply quadrate. Hind margin of 2nd joints of peraeopods 3–5 straight or almost so, the lower hind angle sharply quadrate.

Colour: pigment forming definitely localized patches, the component chromatophores not distinctly separated.

DISTRIBUTION. South Georgia; Cape Adare and McMurdo Sound; Palmer Archipelago.

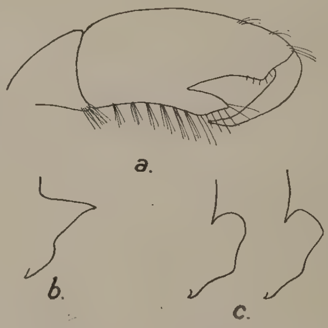

Fig. 151. *Jassa pusilla* (Sars). *a*. Gnathopod 2 ♂. *b*. Profile of epistome and upper lip. *Jassa ingens* (Pfr.). *c*. Profile of epistome and upper lip.

Jassa pusilla (Sars) (Fig. 151 *a*, *b*).

Sars, 1895, p. 596, pl. ccxiii, fig. 1.
Stebbing, 1906, p. 655.
Sexton, 1911, p. 214, p. xiii, fig. 11.

Occurrence: St. 4. Tristan da Cunha. 5 ♂♂ 4–5 mm., 2 ovig. ♀♀ 3·75 mm.

REMARKS. Epistome with a triangular sharply pointed projection. Antero-inferior angle of side-plate 1 rounded-quadrate, not acute. Lower margin of side-plate 2 forming an even curve with those of side-plates 1 and 3.

Gnathopod 2 in the ♂ with thumb subacute and with the *outer* distal margin obliquely bevelled. Peraeopod 3 with 2nd–5th joints very broad (cf. *frequens*, Chilton, 1921, p. 227, fig. 4*D*).

The identification of these specimens with Sars' species is only provisional, pending comparison of more specimens with material from northern waters.

Genus **Ischyrocerus**, Kröy.

Stebbing, 1906, pp. 657, 739.
Barnard, 1916, p. 264.

Ischyrocerus anguipes, Kröy., var. **longimanus**, Hasw.

Barnard, 1930, p. 393.

Occurrence: St. 5. Tristan da Cunha. 2 ♂♂ 3·5 mm., 3 immat. ♂♂ 3 mm., 2 ovig. ♀♀ 2·75 mm.

REMARKS. These appear to be typical examples of the var. *longimanus*, with the tooth at base of the 6th joint in gnathopod 2 in the ♂; in the adult ♂ the tooth is well developed and projects backwards. No epistomial projection.

Colour, pale, mottled with greyish, especially on head and first five peraeon segments.

DISTRIBUTION (of var. *longimanus*). South-east Australia; New Zealand; Auckland Islands. The distribution is curious and needs confirmation.

Genus **Parajassa**, Stebb.

Stebbing, 1906, p. 649.

Parajassa tristanensis (Stebb.).

Stebbing, 1888, p. 1141, pl. cxxi; 1906, p. 650.

Occurrence: St. 4. Tristan da Cunha. Fifteen specimens ♂♂ and ovig. ♀♀ 3–3·5 mm.

REMARKS. For colour see under next species.

DISTRIBUTION. Tristan da Cunha, 110 fathoms.

Parajassa georgiana, Schell. (Fig. 152).

Schellenberg, 1931, p. 247, fig. 128.

Occurrence: St. MS 10. South Georgia. 2 ♂♂ 4·5 mm.

DESCRIPTION. Closely allied to, but larger and more robust than *tristanensis*. The epistomial projection more strongly developed than in the latter species, laminate. Antenna 2 longer and stouter than antenna 1, as in *pelagica*, but without the dense fascicles of setae found in that species.

Gnathopod 1, 5th joint oblong, relatively broader than in *tristanensis*, 6th subtriangular, the palm longer than hind margin, defined by a spine. Gnathopod 2 very strong, 2nd joint broadly expanded on front and hind margins, 3rd with front margin produced in a subacute tooth, 5th proximally gibbous as in *tristanensis*, 6th almost as broad (distally) as long, palm slightly oblique, with a blunt somewhat crenulate tooth near hinge, followed by a shallow excavation, defining tooth subacute. Peraeopods 1 and 2, 2nd joint stout, especially in peraeopod 2.

REMARKS. Future research may prove that this is only a form of *tristanensis*. But the differences are very striking when the two forms are placed side by side, and for the present they should be kept separate in the same way as should *Jassa falcata* and *ingens*.

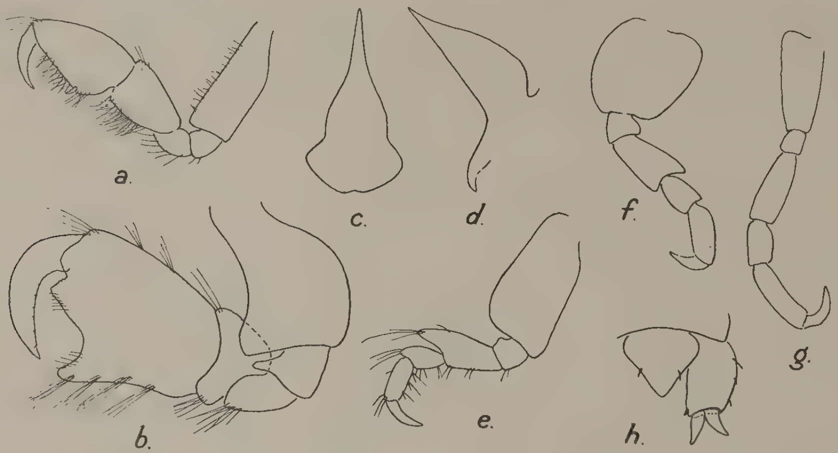

Fig. 152. *Parajassa georgiana*, Schell. *a*. Gnathopod 1. *b*. Gnathopod 2 ♂. *c*, *d*. Frontal and profile views of epistome and upper lip. *e*, *f*, *g*. Peraeopods 2, 3, 5 respectively. *h*. Telson and uropod 3.

The coloration, as preserved, is the same as in the above specimens of *tristanensis*, viz. dark greyish bands on the head and anterior peraeon segments, with a darker, almost black spot on each of side-plates 1–5.

Family COROPHIIDAE

Stebbing, 1906, pp. 662, 739.

Genus **Corophium**, Latr.

Stebbing, 1906, pp. 685, 740.
Stephensen, 1915, p. 52.
Chevreux and Fage, 1925, p. 363.

Corophium bonellii (M. Edw.).

Chevreux and Fage, 1925, p. 369, fig. 377.
Barnard, 1930, p. 393.

Occurrence: 34° 23′ N, 14° 32′ W. 14. x. 25. 0 m. (9 a.m.). 5 ♂♂ 3–4 mm., 2 ♀♀ 3·5 mm.

Distribution. North Atlantic; Alaska.

Corophium cylindricum (Say).

Stebbing, 1914, p. 372.

Occurrence: St. 54. Falklands. 6 ♀♀ (1 ovig.) 3·5–4·5 mm.

Remarks. I have seen neither Holmes' nor Paulmier's papers, quoted by Stebbing, and therefore accept Stebbing's identification, though I cannot find any points of difference which would separate the present specimens from *bonellii*.

Colour (as preserved), pale, with a grey band across top of head between eyes, and a grey band across each segment, eyes black.

Distribution. East coast of North America; Falkland Islands.

Genus **Cerapus**, Say.

Stebbing, 1906, pp. 665, 740; 1910, p. 616.

Cerapus oppositus, n.sp. (Fig. 153).

Occurrence: 1. St. 190. Palmer Archipelago (90–130 m.). 1 ovig. ♀ 3 mm., with tube.
2. St. MS 71. South Georgia. 3 ♂♂ 2·5 mm., 3 ♀♀ 2 mm., with tubes. *Types.*

Description. Closely resembling *crassicornis* (cf. Sars, pl. ccxvii). Rostrum projecting only a little distance beyond the level of the acute antero-lateral angles of head. Antennae 1 and 2, flagellum in both sexes 2-jointed.

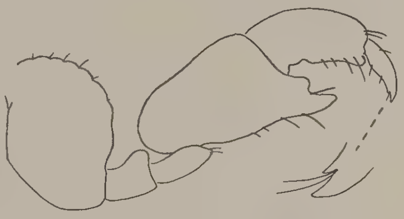
Fig. 153. *Cerapus oppositus*, n.sp. Gnathopod 2 ♂.

Gnathopods 1 and 2 in ♀, and gnathopod 1 in ♂ as figured by Sars. Gnathopod 2 in ♂, 5th joint shorter and more triangular in shape, without tooth on lower margin, 6th notched near base on lower margin, finger shorter than 6th.

Peraeopods 1–5 as figured by Sars, but 2nd joint in peraeopod 1 broadly oval, and dactyls of peraeopods 1 and 2, especially the latter, shorter.

The tubes are of a leathery texture, without sand grains, cylindrical and open at both ends.

Genus **Pseuderichthonius**, Schell.

Schellenberg, 1926, p. 385.

Pseuderichthonius gaussi, Schell.

Schellenberg, 1926, p. 385, fig. 66.

Occurrence: 1. St. 170. South Shetlands. 1 ♀ 16 mm.
2. St. 175. South Shetlands. 1 immat. ♀ 14 mm., 1 ♀ (anterior half only).

Remarks. Except in size, I see no differences between these specimens and Schellenberg's description and figures.

Antenna 1, 3rd joint longer than 1st and almost as long as 2nd, flagellum about equal to 2nd and 3rd peduncular joints together, about 16-jointed, peduncle and flagellum with long setae, no accessory flagellum. Antenna 2, flagellum 18-jointed. Inner lobe of maxilla 1 with seven setae.

Gnathopods 1 and 2, palm defined by a spine, and hind margin slightly convex. The long setae bordering the palm are very definitely grouped in slightly oblique rows; those on the anterior margin of the hand also are arranged in transverse rows and are far more abundant on gnathopod 1 than on gnathopod 2. The inner surface of 5th and 6th joints, especially in gnathopod 1, bear a number of long setae arranged in transverse rows.

The ramus of uropod 3 bears four spines on its upper margin in addition to the terminal unguis or point, before which is a short seta.

The Gauss collection contained an ovigerous ♀ 8 mm. long, but no males.

Distribution. 'Gauss' winter station, 385 m.

Family PODOCERIDAE

Stebbing, 1906, p. 694.

Genus **Podocerus**, Leach.

Stebbing, 1906, pp. 700, 741.
Barnard, 1916, p. 276; 1925, p. 366.
Chilton, 1926, p. 513.

Podocerus ? brasiliensis (Dana).

Stebbing, 1914, p. 373.

Occurrence: St. 51. Falklands. 1 immat. ♂, 3 ♀♀ (2 ovig.) 4–5 mm.

Remarks. All the peraeon segments tend to develop corrugations or humps, not keels, especially segments 3 and 4 in the ♂; pleon segments 1–3 also gibbous, especially segment 1 in the ♂ (cf. Bate, 1862, pl. xlvi, fig. 8, *darwini* = *variegatus*). Second joints of peraeopods 1 and 2 linear. Sixth joint of gnathopod 2 in ♀ broader than in Dana's figure.

The identification is not at all certain. The corrugated dorsal profile would seem to exclude it from *brasiliensis*, and I would have suggested *variegatus* had not Stebbing already recorded Dana's species from the Falkland Islands.

Podocerus septemcarinatus, Schell. (Fig. 154).

Schellenberg, 1926, p. 388, fig. 68 (paper received at Brit. Mus. June 18).
Monod, 1926, p. 61, figs. 59, 60 (*hystricoides*) (publ. August 20).

Occurrence: 1. St. 182. Palmer Archipelago. 1 immat. ♂ 5 mm.
2. St. 190. Palmer Archipelago (90–130 m.). 3 ♂♂ 7 mm., 2 juv. 3·5 mm.

Remarks. A figure is here given of the hand of gnathopod 2 of a more fully grown ♂ than the Gauss specimens appear to have been.

The Belgica and Gauss specimens are undoubtedly the same species, and I have to thank Dr Calman of the British Museum for informing me of the date when Schellenberg's paper, which bears no date of publication other than the year, was received at the British Museum library.

The colour of no. 2, which were found crawling on a colony of *Cephalodiscus hodgsoni*, was "Pale yellowish buff, vaguely banded with orange. Eyes pink".

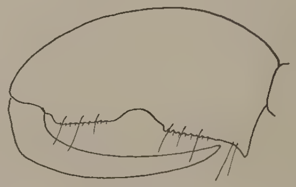

Fig. 154. *Podocerus septemcarinatus*, Schell. Gnathopod 2 ♂.

Distribution. 'Gauss' winter station, 385 m.; 70° 15′ S, 84° 06′ W, 569 m.

Podocerus, sp. (Fig. 155).

Occurrence: St. 42. South Georgia. 1 immat. 4 mm.

REMARKS. Dorsal profile somewhat resembling that of *danae*, Stebb. (1888, pl. cxxviii), but the projections are not keels so much as corrugations or transverse ridges on the hind margins of the segments. The ridges are slightly more raised medio-dorsally into tubercles on peraeon segments 4–7 and pleon segment 1, and there are very faint indications of a smaller dorso-lateral tubercle on each side.

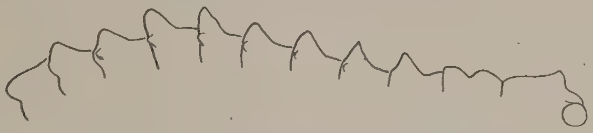

Fig. 155. *Podocerus*, sp. St. 42. Dorsal profile.

Gnathopod 2, 6th joint subcircular, palm defined from hind margin only by a small tooth. Peraeopods 1 and 2, 2nd joint slender, linear. Peraeopods 3–5, 2nd joints feebly pyriform, slightly wider proximally than distally.

With only one immature specimen (probably ♂) it is not advisable to assign a specific name in this case.

GAMMARIDEORUM INCERTAE SEDIS

Didymochelia, Brnrd.

Barnard, 1931, p. 429.

No rostrum. No eyes. Side-plates well developed, 4 feebly emarginate behind, 5 bilobed. Pleon segments 5 and 6 very short. Telson transversely oblong, entire. Antenna 1 stout, with a short accessory flagellum. Mouth-parts prominently projecting. Upper lip elongate, narrow. Lower lip with acuminate outer lobes and very small mandibular processes, without inner lobes. Maxilla 1, inner lobe setose along whole inner margin, palp obscurely 2-jointed. Maxilla 2, inner lobe with oblique row of setae as well as the marginal row. Gnathopods 1 and 2 not strong, chelate. Peraeopods 1–5 alike, stout. Uropods 1 and 2 stout, biramous. Uropod 3 rudimentary, consisting of a small ovate peduncle only.

REMARKS. It is difficult to decide on the affinities of this Amphipod. Several of its features, such as the projecting and somewhat pointed mouth-parts, the similarity of the peraeopods, and the reduction of uropod 3, would seem to be due to its habitat and mode of life in the galleries of sponges. There is some resemblance in general body form to the aberrant Lysianassid *Pachychelium*, but the only features which may really be said to be Lysianassid are the 1st antenna and the lower lip. Gnathopods 1 and 2 bear a remarkable resemblance to those of *Pariphimedia integricauda*, Chevr.; and in some respects the mouth-parts also are not unlike. In fact it would perhaps not be inconsistent to include this Amphipod in the Acantonotozomatidae, but for the presence of the accessory flagellum. This latter feature also militates against placing it in the somewhat heterogeneous group of genera comprising the Calliopiidae. On the whole I am rather inclined to include it among the Lysianassidae.

Didymochelia spongicola, Brnrd. (Fig. 156).

Barnard, 1931, p. 429.

Occurrence: St. 142. South Georgia. 1 ♂ 4 mm., from sponge.

DESCRIPTION. Head with scarcely any median point, but anterior margin rather deeply sinuous around base of antenna 1, antero-inferior angle rounded. No trace of eyes. Peraeon dorsally rounded; postero-inferior angles of segments 5–7 slightly produced, subacute. Side-plates 1–4 quadrangular, lower margins rounded, 4 not deeply excavate; 5 bilobed, the anterior lobe slightly deeper than the posterior; 6 and 7 posteriorly produced in acute points. Pleon segments 1 and 2 dorsally rounded, 3 with a small upturned triangular carinal tooth on hind margin; 4 with slight transverse depression, posterior margin raised into a transverse tooth; segments 5 and 6 very short; postero-inferior angles of segments 1–3 ending in short acute points. Telson transverse, broader than long, rounded posteriorly, a short stout spine on each side of the feebly concave distal margin.

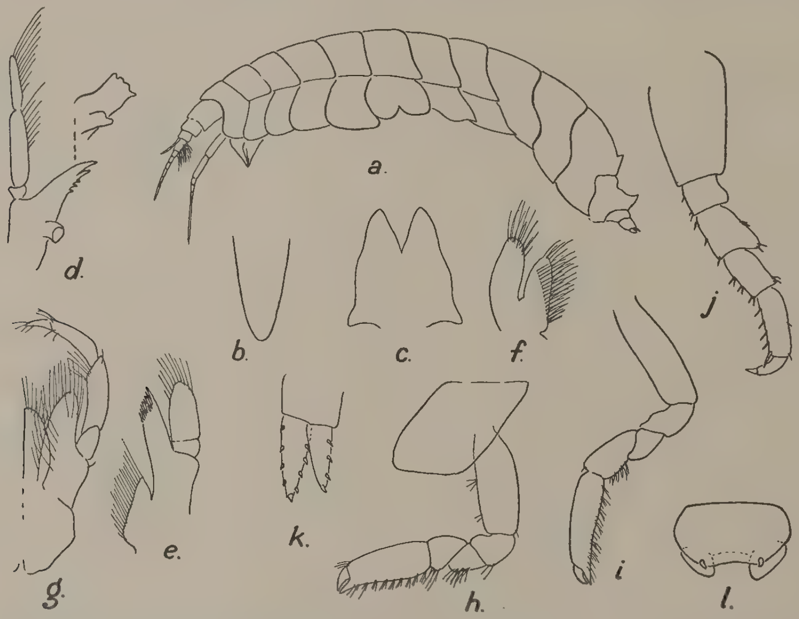

Fig. 156. *Didymochelia spongicola*, Brnrd. *a*. General view. *b*. Upper lip. *c*. Lower lip. *d*. Mandible, with cutting edge and secondary cutting plate further enlarged. *e*. Maxilla 1. *f*. Maxilla 2. *g*. Maxilliped. *h*. Side-plate 1 and gnathopod 1. *i*. Gnathopod 2. *j*. Peraeopod 5. *k*. Uropod 2. *l*. Telson and uropod 3.

Antenna 1, 1st joint stout, flagellum 8-jointed, 1st joint longest and bearing a brush of setae, accessory flagellum 4-jointed. Antenna 2 slender, flagellum 8-jointed.

Mouth-parts prominently projecting, though not styliform. Upper lip elongate-triangular, apically narrowly rounded. Lower lip without inner lobes, outer lobes apically subacute, mandibular processes very small. Mandible, cutting edge obscurely dentate, secondary cutting plate in both mandibles, spine row of three to four very short setules, molar tuberculiform, palp with 3rd joint nearly as long as 2nd. Maxilla 1, inner lobe rather long but narrow, setose along whole inner margin, outer lobe obliquely truncate, palp strong, ovate, obscurely 2-jointed, apically setose. (The figure shows the appendage flattened out; normally the plane of the palp is at right angles to that of the outer lobe.) Maxilla 2, both lobes apically rounded, subequal, inner lobe with oblique row of setae as well as marginal row. Maxilliped, outer plate not greatly larger than inner plate, both with plumose setae, palp slender, 4-jointed, 1st joint shorter than either 2nd or 3rd.

Gnathopod 1, 2nd joint stout, 4th and 5th short, triangular, 6th subequal to 2nd, nearly cylindrical, tapering slightly distally, chelate, finger matching thumb. Gnathopod 2 similar to gnathopod 1, but rather more slender, 3rd and 5th joints longer.

Peraeopods 1–5, stout, alike, though 2nd joint in peraeopod 5 is wider proximally, 4th joint scarcely produced apically.

Uropods 1 and 2 stout, outer rami slightly shorter than inner rami, margins with a few stout spinules. Uropod 3 rudimentary, consisting of a short ovate peduncle only.

HYPERIIDEA

In 1909 Woltereck on the basis of his studies of material from various deep-sea expeditions introduced a new classification of certain groups of the Hyperiid Amphipods. These studies were admittedly preliminary, but up to the present no fuller investigations have been published. In 1929 Pirlot made some criticisms of Woltereck's views and suggested a different arrangement. The two schemes may be set out side by side to show their respective points of difference and agreement (see p. 480).

In the Terra Nova Report (1930) I pointed out that the name "Pygmaeidae" was inadmissible and suggested the name Archaeoscinidae, having overlooked the fact that Stebbing had already foreseen the possibility of its being introduced later.

Pirlot makes *Archaeoscina*, the type of the family Archaeoscinidae, separate from the other genera of Woltereck. For these latter he uses the inadmissible name "*Pygmaeidae*", though suggesting that the family name ought more properly to be Micromimonectidae.

It is obvious that if we separate *Archaeoscina*, each of the other genera is worthy of its own family. For the present we know far too little about these curious forms to make it worth while increasing family names. I am, however, following Pirlot in separating the Archaeoscinidae, and I adopt the name Micromimonectidae after the earliest of the three remaining genera.

Such terms as "Primitiva", "Recticornia", etc., are not employed here as it is not the purpose of this report to discuss the major aspects of the classification of the Hyperiid Amphipods.

Woltereck, 1909 and 1927		Pirlot, 1929
Suborder *Hyperiidea Gammaroidea*		Tribe *Hyperiidea Physosomata*
Tribe *Primitiva*		
Subtribe *Completa*		
Lanceolidae		*Lanceolidae*
	Micromimonectes	
	Mimonecteola	*Pygmaeidae*
"*Pygmaeidae*"	*Microphasma*	
	Archaeoscina	*Archaeoscinidae*
Subtribe *Incompleta*		
Chuneolidae		*Chuneolidae*
	Mimonectes	*Mimonectidae*
Eumimonectidae	*Sphaeromimonectes*	
	Parascina[1]	
		Scinidae
Tribe *Derivata*		
Scinidae		
		Tribe *Hyperiidea Eugenuina*
		Recticornia
Vibiliidae		*Vibiliidae*, etc.
Suborder *Hyperiidea Genuina*		
Recticornia		
Filicornia		*Filicornia*
Curvicornia		*Curvicornia*

Family MICROMIMONECTIDAE

Woltereck, 1909, p. 147 ("Pygmaeidae" part).
Pirlot, 1929, p. 51.
Barnard, 1930, p. 394 (Archaeoscinidae part).

Genus Micromimonectes, Wolt.

Woltereck, 1906, p. 189; 1909, p. 154.

No specimens of this genus have been reported since its inception by Woltereck for two ♀♀ and one "Physosoma" larva captured by the 'Valdivia'.

Micromimonectes irene, Wolt. (Fig. 157).

Woltereck, 1906, pp. 189, 190, figs. 1, 2; 1909, pl. v, fig. 12.

Occurrence: St. 71. South-west Atlantic. One specimen 4 mm.

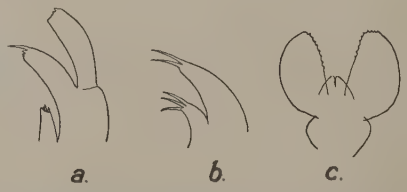

Fig. 157. *Micromimonectes irene*, Wolt. *a*. Maxilla 1. *b*. Maxilla 2. *c*. Maxilliped.

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[1] Pirlot (p. 171) makes Woltereck place this genus in the Scinidae, but Woltereck did not include it in his grouping on p. 147, and in fact did not actually place it anywhere; but he regarded it and *Sphaeromimonectes* as so closely related (p. 149) that one might conclude he wished to place it with the latter genus in the Eumimonectidae, as above. In 1927 he definitely makes it a synonym of *Sphaeromimonectes*. There is no question that Woltereck's name antedates Stebbing's name (Barnard, 1930, p. 394).

Remarks. This specimen does not appear to differ from *irene* as far as one can judge from the figures given by Woltereck for the ovigerous ♀. It has the body filled with a very fine granular mass which may possibly be developing ova, but there are no brood lamellae.

The mandibular palp was evidently 3-jointed, but the terminal joint on both mandibles is now missing. Maxillae 1 and 2 are as figured; the latter has two very strong spines on the outer lobe and three on the inner lobe. The maxilliped resembles that of a *Vibilia*, but has the inner plates separate.

Distribution. Indian Ocean (off Sumatra).

Genus Mimonecteola, Wolt.

Woltereck, 1909, p. 153.

Mimonecteola macronyx, n.sp. (Fig. 158).

Occurrence: St. 287. East mid-Atlantic. 1 (? ♂) 9 mm.

Description. Anterior peraeon segments swollen. First peraeon segment short. Eyes invisible. Side-plates on segments 3 and 4 anteriorly acute. Telson lanceolate, apex acute, reaching to half length of peduncle of uropod 3. Posterior portion of alimentary canal opaque.

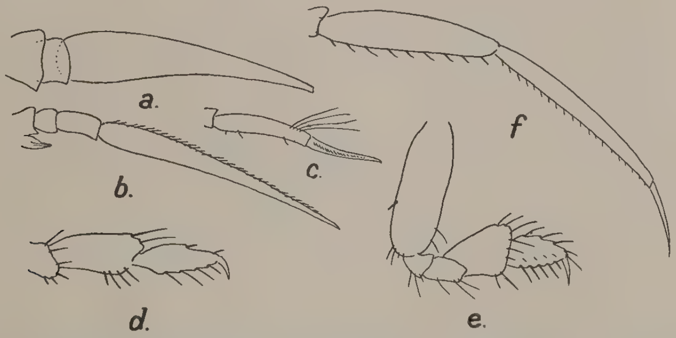

Fig. 158. *Mimonecteola macronyx*, n.sp. *a*. Antenna 1. *b*. Antenna 2. *c*. Mandibular palp. *d*. Gnathopod 2. *e*. Gnathopod 1. *f*. Peraeopod 5.

Antenna 1, terminal joint ensiform, smooth. Antenna 2 about as long as antenna 1, 5th (4th free) joint elongate, ensiform, upper margin finely setose. Mandibular palp with a few long setae at apex of 2nd joint, 3rd joint shorter than 2nd, slender, curved.

Gnathopod 1, 5th joint triangular, distal width equal to length, 6th ovate, dactyl half length of 6th. Gnathopod 2, 5th joint cylindrical, 6th narrow-ovate.

Peraeopods 1–5 similar, elongate, peraeopod 5 shorter than peraeopod 4, 5th joint narrow-ovate, scarcely swollen, 6th elongate, slender, longer than 5th, dactyl very slender, about two-fifths length of 6th joint.

Uropods all slender, rami, including those of uropod 3, shorter than their peduncles, margins minutely serrate.

REMARKS. This specimen resembles *M. diomedeae* in general shape, the pointed side-plates on segments 3 and 4, elongate terminal joint of antenna 2, and mandibular palp; but differs sharply in the very large dactyls of peraeopods 1–5.

M. diomedeae was found in the Pacific by the 'Albatross', and since Woltereck's very brief description of it in 1909, no further specimens of the genus have been reported.

Family MIMONECTIDAE

Bovallius, 1889, p. 59.
Woltereck, 1909, p. 147 (Eumimonectidae).
Stephensen, 1923, p. 5; 1925 *a*, p. 244 (Eumimonectidae).
Pirlot, 1929, pp. 46, 53 (Mimonectidae + Scinidae part).
Barnard, 1930, p. 394.

Here again family delimitations are uncertain owing to the varying importance attached to the character of the maxilliped by different authors. Stephensen and Pirlot place *Parascina* (with separate inner plates in the maxilliped) alongside *Scina* (with fused inner plates); Woltereck separates them. If general appearance has any value, the former authors are certainly correct, for the globular *Mimonectes* is very different from the more normally shaped *Parascina* and *Scina*. In pelagic forms, however, external appearance is liable to be very misleading (cf. also *Katius* and *Eurythenes*, *supra*, p. 56). Eventually a separate family will probably be instituted for *Parascina* and *Sphaeromimonectes*.

Genus **Parascina**, Stebb.

Stebbing, 1904, p. 20 (♀).
Woltereck, 1909, p. 151.
Stephensen, 1918, p. 17 (♂).
Pirlot, 1929, p. 53 (incl. *Sphaeromimonectes*).
Barnard, 1930, p. 395.

I am not prepared to accept, as yet, Pirlot's suggestion to include all Woltereck's *Sphaermimonectes* species in this genus.

Parascina fowleri, Stebb.

Stebbing, 1904, p. 21, pl. ii, fig. *B* (♀).
Chevreux, 1919, p. 9 (part).
? Woltereck, 1909, p. 150, fig. 8.
Non Stephensen, 1918, p. 17.

Occurrence: St. 87. South-east Atlantic. 1 ♀ 8 mm. (mutilated).

REMARKS. This ♀ specimen agrees with Stebbing's description and figures, but the upper margin of antenna 1 appears to lack setae. The pointed process above the base of the dactyl in gnathopods 1 and 2 is broader than in Stebbing's figures. The brood lamellae are not developed. The specimen is not in very good condition.

The great resemblance between this species and *Sphaeromimonectes diomedeae* has already been mentioned by Woltereck (1909, p. 151) and I have advocated transferring the latter species to the genus *Parascina* (1930, p. 395). Having seen examples of both the supposed ♀ and ♂ forms, I am inclined to regard *S. diomedeae* as synonymous with the *P. fowleri* of Stebbing, and to agree with Pirlot that the form described and figured by Chevreux and Stephensen represents a different species. The differences between Stebbing's form and *diomedeae*, as detailed by Woltereck (1909, p. 151), seem to me of very minor importance.

The present specimen considerably extends the known distribution of this species southwards. *S. diomedeae* was captured in the Pacific.

DISTRIBUTION. North Atlantic, southwards to 31° N.

Parascina chevreusi, Pirlot.

Chevreux, 1905, p. 1 (♂) (*fowleri*, *non* Stebb.); 1919, p. 9 (part) (*fowleri*, *non* Stebb.).
Stephensen, 1918, p. 17, figs. 5, 6 (♂) (*fowleri*, *non* Stebb.).
Pirlot, 1929, p. 56.

Occurrence: 1. St. 287. East mid-Atlantic. 1 ♂ 9 mm.
2. St. 288. East mid-Atlantic. 1 ♂ 12 mm.

REMARKS. The specimens agree with Stephensen's description and figures, but the upper margin of antenna 1 in no. 1 is densely beset with fine setae instead of somewhat coarse filamentous setae.

DISTRIBUTION. North Atlantic.

Family LANCEOLIDAE

Bovallius, 1887, p. 5.
Stephensen, 1918, p. 8.
Woltereck, 1927, p. 59.
Barnard, 1930, p. 397.

Genus **Lanceola**, Say.

Bovallius, 1887, p. 28 (key to species).
Stebbing, 1904, p. 28 (key to species).
Woltereck, 1905, pp. 413, 416 (Physosoma larva); 1927, pp. 60, 68.
Stephensen, 1918, p. 8.
Chevreux, 1920, p. 1.

These Amphipods are typically bathypelagic, and even at night rarely rise nearer the surface than about 100 m. They reach a large size (Woltereck, 1905, p. 414: 61 mm.), but the great majority of specimens captured are considerably smaller and represent immature stages (Stephensen, 1918, p. 12). The largest specimens in the Discovery collection are two ♂♂ of 40 mm. and a ♀ of 42 mm.; the latter is not ovigerous.

The fact that descriptions of the species have often been based on immature specimens makes the systematics of this genus somewhat difficult (cf. Woltereck, 1905, p. 414), and in practice it will be found that the use of Bovallius' and Stebbing's keys lead to conflicting results.

In the present material the separation of the four species has been comparatively easy and the following synopsis may be given to facilitate future identification in the field.

I. Pleon serrate. Peduncle of all uropods slender, rami narrow lanceolate ... ... *serrata*

II. Pleon not serrate.

A. 5th joint of gnathopod 1 broad, 4th joints of peraeopods 1–3 narrow.

1. Peduncles of uropods 1 and 2 stout, rami ovate lanceolate. Telson as long as peduncle of uropod 3.

a. Rostrum distinct ... ... *sayana*

b. Rostrum obsolete ... ... *pacifica*

2. Peduncles of all uropods slender, rami narrow lanceolate. Telson much shorter than peduncle of uropod 3 ... ... *aestiva*

B. 5th joints of gnathopod 1 narrow, 4th joint of peraeopods 1–3 broadly expanded ... *remipes*

Both Stebbing (1904) and Stephensen (1923, p. 3) consider that *murrayi* should be relegated as a synonym of *felina*, and it seems possible that *aestiva* may also be synonymous, though both Chevreux (1920) and Stephensen (1918 and 1923) retain the latter as a distinct species.

Chevreux's species *stephenseni* (1920) seems to be a young form (12 mm.) with the 3rd–5th peraeopods nearly the same length. Compare the young specimens of *pacifica* (*infra*) in which also the anterior peraeon segments are swollen, and the 3rd and 4th peraeopods have not attained their full elongation.

Lanceola sayana, Bov.

Bovallius, 1887, p. 30, pl. iv and pl. v, fig. 1.
Stephensen, 1918, p. 8, figs. 1–3; 1923, p. 3.
Chevreux, 1920, p. 1.
Woltereck, 1927, p. 60, figs. 1 *a*, 1 *b*, 2, 3, 4 *a*, 4 *c*.

Occurrence: 1. St. 284. East mid-Atlantic. 2 immat. 15 and 17 mm.
2. St. 285. East mid-Atlantic. 3 immat. 15–17 mm. (largest perhaps ♂).
3. St. 286. East mid-Atlantic (102–0 m.). 1 ♂ 19 mm.
4. *ditto* (125–0 m.). 1 ♂ 22 mm., 2 juv. 12 and 14 mm.
5. St. 288. East mid-Atlantic. Three specimens 19–22 mm., 1 juv. 15 mm.
6. St. 294. East mid-Atlantic. 1 ♂ 22 mm.

REMARKS. This species seems to be rather less bathypelagic than the other species. Tattersall (1906, p. 16) records it from the surface.

DISTRIBUTION. Atlantic, 56° N–$32\frac{1}{2}$° S; Indian and Pacific Oceans.

Lanceola serrata, Bov.

Bovallius, 1887, p. 34, pl. v, figs. 2–13.
Stebbing, 1904, p. 29.
Tattersall, 1906, p. 17.
Stephensen, 1918, p. 15; 1923, p. 4.
Chevreux, 1920, p. 2.

Occurrence: 1. St. 9. South Atlantic (0–3500 m.). 1 ♂ 27 mm.
2. St. 71. South-west Atlantic. 1 juv. 18 mm.
3. St. 78. South Atlantic. 1 ♂ 28 mm.
4. St. 86. South-east Atlantic. 1 immat. (? ♀) 27 mm.
5. St. 89. South-east Atlantic. 1 ♂ 40 mm.
6. St. 101. South-east Atlantic (1310–1410 m.). 1 ♂ 32 mm. (poor condition).
7. St. 107. South-east Atlantic. 2 ♀♀ 42 and 27 mm.

8. St. 114. Bouvet Island. 1 ♂ 37 mm., 2 juv. 23 mm.
9. St. 239. South-west Atlantic. 1 juv. 20 mm. (poor condition).
10. St. 253. South-east Atlantic. 1 immat. 23 mm. (poor condition).
11. St. 256. South-east Atlantic. 2 juv. 10 and 16 mm.

Remarks. The colour of nos. 2, 3 and 5, respectively, are given as: "Transparent with red thoracic legs and red mouth-parts", "Port-wine colour", and "Deep port-wine colour".

The discovery of this species in the South Atlantic, between 33° and 52° S, forms a notable extension of the known distribution.

L. suhmi, Stebb., has already been regarded as synonymous with *serrata*, and it is probable that *australis* also should be added.

Distribution. Davis Strait and North Atlantic as far south as 41° N.

Lanceola pacifica, Stebb.

Stebbing, 1888, p. 1302, pls. cli, clii.
Woltereck, 1909, p. 160 (var. *robusta*); 1927, p. 64, figs. 1 *c*, 4 *b*.
Stephensen, 1918, p. 14, fig. 4; 1923, p. 4.
Chevreux, 1920, p. 2.

Occurrence: 1. St. 76. South-west Atlantic. 1 ♂ 28 mm.
2. St. 81. South Atlantic. 1 ♂ 26 mm.
3. St. 86. South-east Atlantic. 1 ♀ 38 mm.
4. St. 101. South-east Atlantic (850–950 m.). 1 ♂ 24 mm.
5. St. 245. South Atlantic. 1 ♀ 22 mm.
6. St. 256. South-east Atlantic. 1 juv. 16 mm.
7. St. 281. East mid-Atlantic. 1 ♂ 30 mm., 1 ♀ 30 mm., 4 juv. 9, 10, 14 and 17 mm.
8. St. 287. East mid-Atlantic. 1 immat. 23 mm., 2 juv. 6 and 11 mm.

Remarks. The colour of no. 1 is given as "Deep port-wine colour". The young of nos. 7 (9 mm.) and 8 (6 mm.) have the anterior peraeon segments somewhat swollen, the 3rd–5th peraeopods nearly subequal in length, and the latter (no. 8) has the 5th joint of gnathopod 1 not much wider than the 6th; thus closely resembling the 12 mm. specimen described by Chevreux as *stephenseni*.

This species also has not hitherto been found in the South Atlantic.

Distribution. North Atlantic; Pacific.

Lanceola aestiva, Stebb.

Stebbing, 1888, p. 1309, pl. cliii.
Woltereck, 1909, p. 160 (bottom of page); 1927, p. 64.
Stephensen, 1918, p. 15; 1923, p. 5.
Chevreux, 1920, p. 3.

Occurrence: St. 298. East mid-Atlantic. 1 (? ♂) 15 mm.

Distribution. Atlantic from 53° N to 8½° S.

Lanceola remipes, n.sp. (Fig. 159).

Occurrence: St. 72. South-west Atlantic. 1 ♂ 40 mm.

Description. Integument moderately firm, covered all over, including appendages, with fine reticulation. Head dorsally carinate, the carina bifurcating anteriorly on the rostrum. Eyes feebly developed, no corneal lenses, ocular pigment (as preserved) whitish.

Peraeon medio-dorsally carinate. The course of the lateral keels can be seen from the figure. Side-plates without prominent anterior corners; 5th longest; horizontal keels on 2, 3, 4 and 6.

Pleon medio-dorsally carinate, but not serrate; a lateral keel on segments 1–4. Telson lanceolate, rather sharply pointed, as long as peduncle of 3rd uropod.

Antenna 1, terminal joint ensiform, triquetral in cross-section, upper margin curved, sharp, lower margin straight, keeled on outer and inner sides, no minute apical joints. Antenna 2 incomplete but very large, 3rd (2nd free) joint with distal spine on inner side (dotted in figure), 4th elongate ensiform, upper margin sharp, lower margin keeled on outer and inner sides, apex lost.

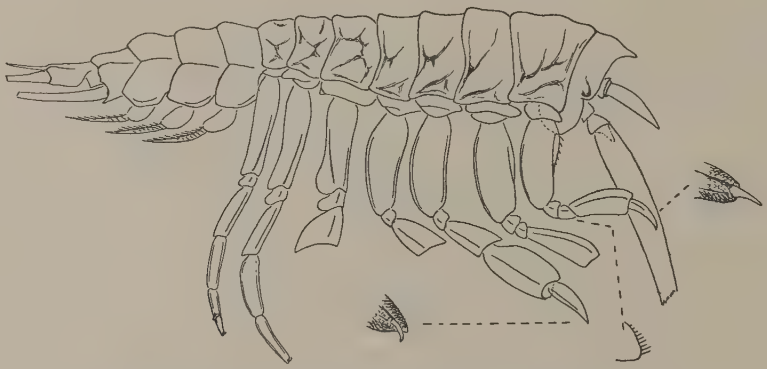

Fig. 159. *Lanceola remipes*, n.sp. General view, with apices of 4th and 6th joints of gnathopod 1, and 6th joint of peraeopod 1 further enlarged.

Gnathopod 1, 5th joint nearly 2½ times as long as broad, 6th half breadth of 5th, with minute 7th joint; a few setae on anterior margin of 2nd joint and lower distal margin of 4th, the joints otherwise smooth; 2nd joint keeled near anterior margin, and 3rd and 4th on middle of outer surface. Gnathopod 2 similar, but 5th joint more slender, 6th lost.

Peraeopod 1, 4th joint distally expanded, 5th expanded, ovate, the lower distal corner forming a rounded flange on inner side, 6th lanceolate, 7th minute; 2nd joint keeled near front and hind margins, 3rd–6th keeled on middle of outer surface. Peraeopod 2 similar, 5th and 6th joints lost. Peraeopod 3, 2nd joint with lower hind corner forming a rounded flange on outside, 3rd with rounded flanges both inside and outside, 4th broadly expanded, following joints lost. Peraeopod 4, 2nd joint with small flange distally, 3rd with two flanges as in peraeopod 3, 4th and 5th subequal, 6th slightly shorter, with terminal retractile claw. Peraeopod 5 similar to, but slightly shorter than, 4th.

Uropod 1, peduncle about four times as long as wide, with median longitudinal keel on lower surface, rami lost. Uropod 2 lost. Uropod 3, peduncle about twice as long as wide, with median longitudinal keel on upper surface, rami lost.

Remarks. Although shorn of many of the joints of its appendages, this specimen is otherwise in good condition, and clearly represents a species hitherto undescribed. *L. pacifica* var. *robusta* has been figured by Stephensen (1918, fig. 4), but the legs in the present specimen are even more robust, as well as possessing several peculiar features. The narrow 5th and 6th joints of gnathopods 1 and 2 are not found among the other species of the genus, and the expanded 4th joints of peraeopods 1–3 and 5th joint of peraeopod 1 are also distinctive.

The colour is recorded as "salmon-pink".

Genus Scypholanceola, Wolt.

Woltereck, 1905, p. 415; 1909, p. 161; 1927, p. 65.
Chevreux, 1920, p. 7.

Distinguished from *Lanceola* by the two concave "reflectors" on the side of the head.

Scypholanceola vanhoeffeni, Wolt.

Woltereck, 1909, pp. 161, 167, pl. vii, figs. 24 *a*, *b*; 1927, p. 65, figs. 5, 8, 9.
Barnard, 1916, p. 290.
Chevreux, 1920, p. 8, figs. 4–6 (*richardi*).
Pirlot, 1929, p. 45 (*richardi*).

Occurrence: 1. St. 85. South-east Atlantic. 2 ♂♂ 30 and 33 mm.
2. St. 86. South-east Atlantic. 1 ♂ 23 mm.
3. St. 87. South-east Atlantic. 1 ♂ 27 mm., 1 juv. 15 mm.
4. St. 89. South-east Atlantic. 1 juv. 13 mm.
5. St. 256. South-east Atlantic. 1 ♂ 20 mm.
6. St. 281. East mid-Atlantic. 1 ♂ 28 mm., 1 immat. 19 mm. and 1 juv. 8 mm.
7. St. 287. East mid-Atlantic. 1 immat. (? ♂) 21 mm.

Remarks. The figure of the head of *richardi* does not seem essentially different from that of *vanhoeffeni*; other characters are not available for comparison as Woltereck only described the head and eyes. Chevreux's description corresponds with my description of the Cape specimen, and I agree with Woltereck (1927) in seeing no reason for the retention of *richardi* as a separate species.

Whether *chuni* should not also be regarded as a synonym of *vanhoeffeni* is another question[1]. Chevreux refers to the variability of the ocular band in *richardi*; and owing to the delicacy of these animals it is more than probable that the shape and extent of the band is altered and damaged by capture and preservation, though Woltereck (1927, p. 66) thinks not. Nos. 6 and 7 in the present collection are from the tropical Atlantic, whence *chuni* was obtained.

Most of the specimens show traces of the internal purplish-brown colour noted in the Cape specimen.

Distribution. Atlantic, 30°–46° N, 35° S and off Cape Point; Indian Ocean; Antarctic ($64\frac{1}{2}°$ S, $85\frac{1}{2}°$ E).

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[1] If so, the name *vanhoeffeni* should have preference, as it is mentioned on p. 161 (1909) together with reference to the figure, whereas the name *chuni* first appears on p. 162. Moreover the figure given in Woltereck's 1905 paper (p. 415, fig. 2) is clearly referable to *vanhoeffeni*.

Family SCINIDAE

Stebbing, 1904, p. 18.
Wagler, 1926 (revision of family); 1927.

Besides *Scina* there are two other genera in this family: *Acanthoscina* and *Ctenoscina*, but neither of these is represented in the Discovery collection.

Genus Scina, Prest.

Stebbing, 1904, p. 22 (key to species).
Stephensen, 1918, p. 19.
Wagler, 1926 (revision and key to species).

Of the twenty-seven species described and figured in Wagler's useful monograph the 'Discovery' has taken twelve. Amongst them there are representatives of all six groups except the *latifrons* group.

It is to be noted that not a single specimen of this genus was taken by the 'Discovery' in the Drake Strait or South Georgia regions. The only existing record of a *Scina* from these regions seems to be Bovallius' record of *Scina tullbergi* from off Cape Horn. On the other hand, the 'Valdivia' took numerous examples of *S. antarctica* Wagl. from the area between Bouvet Island and Enderby Land (cf. also Wagler, 1927, p. 105).

Scina crassicornis (Fabr.).

Stebbing, 1904, p. 24.
Stephensen, 1918, p. 19, chart 2; 1923, p. 9.
Chevreux, 1919, p. 10.
Wagler, 1926, p. 324, figs. 2, 3; 1927, p. 90, fig. 1.
Barnard, 1930, p. 401.

Occurrence: 1. St. 29° 26′ N, 15° 07′ W. 1 ♀ 6 mm., 1 juv. 4 mm.
2. St. 80. South Atlantic. 1 ♀ 8 mm.
3. St. 81. South Atlantic. 1 ♂ 12 mm., 4 ♀♀ 10–12 mm.
4. St. 83. South-east Atlantic. 1 ♂ 10 mm., 2 ♀♀ 9 and 11 mm.
5. St. 86. South-east Atlantic. 1 ♀ 12 mm.
6. St. 87. South-east Atlantic. 1 ♀ 14 mm.
7. St. 89. South-east Atlantic. 1 ♂ 9 mm.
8. St. 254. South-east Atlantic. 1 ♀ 18 mm.
9. St. 259. South-east Atlantic. 2 ♀♀ 15 and 18 mm.
10. St. 268. South-east Atlantic. 1 ♂ 10 mm., 1 ♀ 12 mm.
11. St. 273. East mid-Atlantic. 2 ♀♀ 11 and 13 mm., 1 ovig. ♀ 14 mm.
12. St. 276. East mid-Atlantic. 1 ♀ 13 mm.
13. St. 281. East mid-Atlantic. 2 ♀♀ 14 and 18 mm., 1 ovig. ♀ 13 mm.
14. St. 285. East mid-Atlantic. 1 ♂ 13 mm., 2 ♀♀ 11 mm., 4 ♀♀ 16–21 mm.
15. St. 286. East mid-Atlantic. 1 ♂ 16 mm., 1 ♀ 15 mm.
16. St. 287. East mid-Atlantic. 2 ♀♀ 9 mm. (1 with parasitic Isopod).
17. St. 288. East mid-Atlantic. 3 ♀♀ 8–10 mm., 1 ovig. ♀ 12 mm.
18. St. 296. East mid-Atlantic. 1 ♀ 10 mm.

REMARKS. The ♀♀ in nos. 6 and 9 combine the typical *crassicornis* maxilliped with a 4th peraeopod which is more like that of *curvidactyla*, in that the 6th joint is shorter than the 5th, the latter shorter than the 4th and more slender, and the dactylus midway in length between that of *crassicornis* and *curvidactyla*.

The colour of fresh specimens has been noted on two occasions: no. 2 was "cephalothoracic segments dull vermilion, last three abdominal segments pale crimson; eyes, numerous chromatophores on antennae and a few on body bright vermilion"; and no. 4 was "carapace transparent, stomach and liver visible as a pink reddish mass, gonads pale yellow; last 2 abd. somites with a faint but broad red dorsal stripe; antennae spotted with red in middle, pale at either end; eyes scarlet; legs, pleopods and telson transparent". Chevreux (1919, p. 10) records a similar rosy colour for this species; likewise Stephensen (1923, p. 9).

This species appears to inhabit a shallow zone in summer and a deeper zone in winter (Stephensen, 1918, p. 24) and appears to breed chiefly in April to August in the Mediterranean (*ibid*, p. 25) and in March to June and July in the Atlantic (*ibid*, p. 26). The 'Discovery' took ovigerous ♀♀ in the months of July and August.

DISTRIBUTION. Mediterranean; usually at depths over 500 m.; Atlantic from 58° N to 35° S; Indian Ocean from 2° N to 32° S; southern Pacific Ocean. 0–4000 m.

Scina curvidactyla, Chevr.

Stephensen, 1918, p. 31.
Wagler, 1926, p. 328, fig. 4; 1927, p. 92, fig. 2.
Barnard, 1930, p. 401.

Occurrence: 1. St. 13° 25′ N, 18° 22′ W. 2 ♀♀ 13 and 19 mm.
2. St. 71. South-west Atlantic. 1 ♀ 14 mm. (damaged).
3. St. 76. South-west Atlantic. 1 ♀ 14 mm.
4. St. 78. South Atlantic. 1 ♀ 17 mm.
5. St. 85. South-east Atlantic. 1 ♀ 11 mm.
6. St. 250. South Atlantic. 1 ♀ 15 mm.
7. St. 256. South-east Atlantic. 1 ♂ 14 mm., 2 ♀♀ 14 and 20 mm.
8. St. 267. South-east Atlantic (117–0 m.). 3 ♀♀ 12–13 mm., 1 ovig. ♀ 13 mm.
9. *ditto* (450–550–0 m.). 1 ♂ 13 mm.
10. St. 270. East mid-Atlantic. 1 ♀ 13 mm.
11. *ditto* (200–0 m.). 1 ♂ 11 mm.
12. St. 276. East mid-Atlantic. 1 ovig. ♀ 14 mm., 1 juv. 8 mm.
13. St. 281. East mid-Atlantic. 1 ♂ 12 mm., 1 ♀ 10 mm.

REMARKS. Far too few individuals of this species have been captured to allow of any conclusions as to breeding times; in the above list of occurrences one ovigerous ♀ was taken in July and another in August. The 19 mm. ♀ is the largest specimen yet recorded. None of the specimens show such a *very* short hook-like dactyl on peraeopod 4 as Wagler figured.

The colour of no. 4 is noted as: "Body and carapace [*sic*] rose-red; legs pale rose; antennae, pleopods and tail-fan white". The internal mass of the peraeon still shows salmon-pink, and the eyes are a rather deeper shade.

DISTRIBUTION. Mediterranean; Atlantic from 49° N to 28° S; northern Indian Ocean; southern Pacific Ocean. 0–3000 m.

Scina incerta, Chevr.

Chevreux, 1900, p. 123, pl. xiv, figs. 9 *a–i*; 1914, p. 1, fig. 1.
Wagler, 1926, p. 331, fig. 5; 1927, p. 93, fig. 3.

Occurrence: 1. St. 78. South Atlantic. 6 ♀♀ 6–10 mm.
2. St. 87. South-east Atlantic. 5 ♂♂ 5–9 mm., 4 ♀♀ 5–8 mm.
3. St. 89. South-east Atlantic. 2 ♂♂ 8 and 9 mm., 2 ♀♀ 9 mm.
4. St. 256. South-east Atlantic. 2 ♂♂ 8 and 9 mm., 4 ♀♀ 8–10 mm.

REMARKS. This species has been taken previously only by the Prince of Monaco's expeditions and the 'Valdivia'. Chevreux's coloured figure shows the animal to be a bright carmine.

DISTRIBUTION. Atlantic 45° N–30° S; Indian Ocean from about 7° N–7° S.

Scina langhansi, Wagl.

Wagler, 1926, p. 335, fig. 8.

Occurrence: St. 89. South-east Atlantic. 1 ♀ 4·5 mm.

REMARKS. Peraeopods 1, 2, 4 and 5, and the uropods, are somewhat stouter than in Wagler's figures; and the inner margin of uropod 1 is smooth.

DISTRIBUTION. Atlantic, 6° N–3° S.

Scina borealis (G. O. Sars).

Stephensen, 1918, p. 30, chart 3.
Wagler, 1926, p. 335, figs. 9–11; 1927, p. 94, fig. 4.
Barnard, 1930, p. 401.

Occurrence: 1. St. 78. South Atlantic. 1 ♂ 6·5 mm., 1 ♀ 8 mm.
2. St. 87. South-east Atlantic. 1 ♂ 6 mm.
3. St. 89. South-east Atlantic. 2 ♂♂ 4 mm., 7 ♀♀ 4·5–5 mm.
4. St. 120. South Atlantic. 2 ♂♂ 4 and 6 mm.
5. St. 256. South-east Atlantic. 1 ♀ 5 mm.
6. St. 281. East mid-Atlantic. 1 ♂ 8 mm.

DISTRIBUTION. Mediterranean; Arctic Ocean; Atlantic, south to 49° S; Antarctic Ocean; Indo-Pacific. 0–5000 m.

Scina uncipes, Stebb., forma **spinosa**, Voss.

Wagler, 1926, p. 350, figs. 13 *c*, 15; 1927, p. 96.

Occurrence: St. 87. South-east Atlantic. 2 ♂♂ 6 mm., 1 ♀ 7 mm.

DISTRIBUTION. South Atlantic from 0° to 55° S; Indian Ocean.

forma **affinis**, Wagl.

Wagler, 1926, p. 352, figs. 13 *d*, 16; 1927, p. 96.

Occurrence: St. 89. South-east Atlantic. 1 ♀ 8 mm.

DISTRIBUTION. Indian Ocean.

REMARKS. Although it is fairly obvious that *uncipes*, *lamperti*, *spinosa* and *affinis* are merely forms of one species, they should be distinguished and recorded separately.

Scina marginata, Bov.

Stephensen, 1918, p. 27, chart 3.
Wagler, 1926, p. 361, figs. 19–21; 1927, p. 97.

Occurrence: St. 290. East mid-Atlantic. 1 ovig. ♀ 8 mm.

Remarks. Peraeopods 3 and 4 stout, with broadened joints, uropods also broad, but with the gnathopods characteristic of this species.

Distribution. Mediterranean; Atlantic, 57°–30° N, and 2°–5° S.

Scina submarginata, Tattersall.

Stephensen, 1918, p. 32, fig. 7 (*latipes*).
Wagler, 1926, p. 367, figs. 22–24; 1927, p. 98.
Pirlot, 1929, p. 68, fig. 5 (*crassipes*).

Occurrence: St. 81. South Atlantic. 1 ♀ 5 mm.

Remarks. The single specimen has the 2nd joint of peraeopods 3 and 4, and the uropods broadened as in the ♂, yet it seems to be undoubtedly a ♀. Wagler suspects that the differences between *submarginata* and *marginata* will eventually be shown to be due to sex and age changes. Chevreux (1919) has already reduced *submarginata* to a synonym.

Distribution. Mediterranean; North Atlantic, 53°–26° N; South Atlantic, about 4°–55° S; Indian Ocean.

Scina oedicarpus, Stebb.

Wagler, 1926, p. 369, figs. 25, 26; 1927, p. 99, fig. 5.

Occurrence: 1. St. 89. South-east Atlantic. 1 ♀ 6·5 mm.
2. St. 266. South-east Atlantic. 1 ♀ 6 mm.

Distribution. Atlantic, 7° N–33° S; Indian Ocean.

Scina woltereckі, Wagl.

Wagler, 1926, p. 372, figs. 27, 28; 1927, p. 100.

Occurrence: St. 256. South-east Atlantic. 1 ♀ 7 mm.

Remarks. The inner margin of uropod 1 has three large spines on the left side, two on the right, instead of the single one opposite the outer ramus; otherwise the specimen is in agreement with Wagler's description and figures.

Distribution. Atlantic, 2° N–33° S; Indian Ocean.

Scina rattrayi, Stebb.

Stebbing, 1904, p. 26.
Stephensen, 1918, p. 29; 1923, p. 9.
Wagler, 1926, p. 375, figs. 29–32.

Occurrence: St. 295. East mid-Atlantic. 1 ♂ 4·5 mm.

Distribution. Mediterranean; Atlantic, 63° N–33° S; Indian Ocean.

Scina tullbergi (Bov.).

Stephensen, 1918, p. 29 (*pacifica*).
Wagler, 1926, p. 384, figs. 34, 35 (synonymy); 1927, p. 101, fig. 6.

Occurrence: St. 87. South-east Atlantic. 1 ♀ 5·5 mm.

DISTRIBUTION. Mediterranean; Atlantic, about 54° N–31° S; Pacific (Nicaragua, and Cape Horn); Indian Ocean.

Scina vosseleri, Tattersall.

Chevreux, 1919, p. 11.
Wagler, 1926, p. 416, figs. 48, 49.

Occurrence: St. 6° 55′ N, 15° 54′ W. 1 ♀ 10 mm.

REMARKS. The 6th joint of peraeopods 3 and 4 is not longer than the 5th joint (contrary to Wagler's figure).

DISTRIBUTION. Atlantic, 53° N–31° S; Indian Ocean. 0–2500 m.

Family VIBILIIDAE

Behning, 1913, p. 211 (revision of family).
Stephensen, 1918, p. 32.
Barnard, 1930, p. 402.

Genus **Vibilia**, M. Edw.

Vosseler, 1901, p. 118.
Behning, 1913, p. 212 (key to species); 1925, p. 479.
Stewart, 1913, p. 246.
Stephensen, 1918, p. 33.

With reference to Miss Stewart's paper it may be noted that *V. serrata* is undoubtedly a species of *Cyllopus*, and that *V. hodgsoni* is apparently not a ♂ as stated, but a ♀, or rather a young specimen, and the species is possibly not a valid one.

Behning's revision is useful, but his key to the species is not altogether satisfactory and creates the impression that a further reduction in the number of species may take place in the future. For example, the separation of *longipes*, Bov., from *edwardsii*, Bate, seems very doubtful. Moreover, I think it very probable that *antarctica*, or at least the form here referred to *antarctica*, is really the same as *edwardsii*.

Vibilia viatrix, Bov.

Behning, 1913, p. 217; 1925, p. 482, fig. 12; 1927, p. 117.
Stewart, 1913, p. 247.
Stephensen, 1918, p. 41, fig. 13.
Barnard, 1930, p. 403.

Occurrence: 1. St. 2° 20′ S, 12° 45′ W. 2 ♀♀ 7 and 8 mm
2. St. 69. South-west Atlantic. 1 ♂ 8·5 mm.
3. St. 76. South-west Atlantic. 1 ♀ 8 mm.
4. St. 84. South-east Atlantic. 1 ♀ 7 mm.
5. St. 87. South-east Atlantic. 1 ♂ 6·5 mm.
6. St. 268. South-east Atlantic. 2 ♀♀ 8–8·5 mm.
7. St. 270. South-east Atlantic. 1 ovig. ♀ 8 mm.

REMARKS. Breeding ♀♀ have been found in the North Atlantic in March and October (Stephensen).

Distribution. Mediterranean; Atlantic, 45° N–35° S; Indian Ocean; Pacific Ocean. 0–4000 m.

Vibilia propinqua, Stebb.

Behning, 1913, p. 218; 1925, p. 484, figs. 23–25; 1927, p. 118.
Stewart, 1913, p. 246.
Stephensen, 1918, p. 43, fig. 14.
Barnard, 1930, p. 404.
Non Walker, 1907, p. 6 (= *antarctica*).

Occurrence: 1. St. 87. South-east Atlantic. 1 ♀ 7 mm.
2. St. 89. South-east Atlantic. 1 ♂ 8 mm., 2 ♀♀ 7·5–8·5 mm., 3 juv. 5 mm.

Distribution. Mediterranean; Atlantic, 50° N–34° S; Indian Ocean; Eastern Pacific.

Vibilia antarctica Stebb.

Walker, 1907, p. 6 (*propinqua*, *non* Stebb.).
Behning, 1913, p. 219; 1925, p. 486, figs. 26–31; 1927, p. 118.
Chilton, 1912, p. 514.
Barnard, 1930, p. 404.

Occurrence: 1. St. MS 30. South Georgia. 1 ♀ 13 mm.
2. St. 36. South Georgia (50–0 m.). 1 ♂ 11 mm.
3. *ditto* (90–0 m.). 2 ♂♂ 11–12 mm., 1 ♀ 8 mm., 1 juv. 6·5 mm.
4. St. 46. South-west Atlantic. 1 ♀ 8·5 mm.
5. St. 47. Falklands. 10 ♀♀ and juv. 5–9 mm.
6. St. 49. Falklands. 1 ♀ 8·5 mm.
7. St. 62. South-west Atlantic. 1 ♂ 9 mm., 1 ♀ 8 mm., 1 ovig. ♀ 8 mm.
8. St. 71. South-west Atlantic. 2 ♀♀ 7 and 9 mm.
9. St. 116. Bouvet Island. 3 ♂♂ 12–13 mm., 8 ♀♀ 10–12 mm., 9 juv. 5–6 mm.
10. St. 120. South Atlantic. 1 juv. 7 mm.
11. St. 125. South Georgia. 2 ♀♀ 11 mm.
12. St. 129. South Georgia (84–0 m.). 2 ♂♂, 3 ♀♀ 9–12 mm. (1 ovig. ♀ 12 mm.).
13. *ditto* (0–5 m.). 6 ♂♂, 15 ♀♀ 11–13 mm., 1 juv. 6 mm. (2 ♀♀ ovig.).
14. St. 133. South Georgia (0–5 m.). 1 ♀ 10 mm.
15. *ditto* (100 m.). 3 ♂♂, 12 ♀♀ 10–13 mm.
16. St. 136. South Georgia (0–5 m.). 3 ♀♀ 10–13 mm., 2 juv. 6–7 mm.
17. *ditto* (90–0 m.). 2 ♀♀ 12 mm.
18. St. 137. South Georgia. 4 ♂♂, 24 ♀♀ 10–13 mm.
19. St. 138. South Georgia. 7 ♀♀ 11–13 mm. (2 ovig.).
20. St. 151. South Georgia. 9 ♂♂ 12–14 mm., 2 ♀♀ 11 and 12 mm.
21. St. 169. South Orkneys. 7 ♂♂ 13–14 mm., 5 ovig. ♀♀ 12–14 mm.
22. St. 208. South Shetlands. 11 ovig. ♀♀ 12–14 mm.
23. St. WS 38. South Georgia. 4 ♂♂, 82 ♀♀ (many ovig.) 12–14 mm.

Remarks. In this collection there are 195 ♀♀ and only 42 ♂♂. Ovigerous ♀♀ were caught to the number of 22 (nos. 7, 12, 13, 19, 21 and 22), but in addition quite a lot at St. WS 38 (no. 23). They were caught in the following months: December (South Georgia area), February (South Orkneys), April (South Shetlands), and May (South-west Atlantic).

Although the material is not very large, it serves to indicate that this species ascends to the upper layers during the night. On only two occasions (nos. 1 and 19) has it been found during the day at a depth less than 100 m.; but it occurs frequently in this upper zone between the hours of (approx.) 8 p.m. and 6 a.m. The negative evidence, though derived from only three stations, confirms this: at St. 71 six other hauls between 1000–0 m. and at St. 120 one other haul at 340–360 (–0) m. were made, but no specimens obtained; at St. 151, 15 hauls were made between 1275–0 m., and specimens were only taken at 500–625 m.

The carpal process of gnathopod 2 does not always reach quite to the end of the metacarpus, but is often not more than two-thirds the length of the latter. The eyes according to Behning are poorly developed, the individual ocelli discernible only with difficulty or not at all. In all the present specimens, as in those of the Terra Nova collection, the eyes are quite well developed and the ocelli easily discernible; they only differ from those of most other species in being of a paler reddish-brown instead of a dark brown or blackish colour.

As already stated I think it very probable that the true name for these specimens should be *edwardsii*, Bate (1861, *Ann. Mag. Nat. Hist.* (3), VIII, redescribed as a n.sp. in 1862, p. 300, pl. xlix, figs. 6, 7), the original locality of which was the Powell Islands (South Orkneys). There is, however, no specimen actually comparable as regards the length of peraeopods 3 and 4 with Bate's figure, or even with *longipes*. A re-examination of Bate's type, if still extant, especially the details of the serrations of the uropods, might be interesting in comparison with the specimens referred to *antarctica* by Behning.

DISTRIBUTION. This typical Antarctic and sub-Antarctic species extends northwards up the west coasts of Africa and South America in the cold Benguella and Chilean currents. The Scotia record is the only previous record anywhere in the neighbourhood of the present localities, the most northerly of which is St. 71 (43° S, 46° W).

Vibilia australis, Stebb.

Stebbing, 1888, p. 1287, pl. cxlix.
Behning, 1913, p. 219; 1925, p. 488, figs. 32–34; and var. *pelagica*, p. 488, figs. 35–41; 1927, p. 119.
Spandl., 1924, p. 21.

Occurrence: St. 67. South-west Atlantic. 6 ♀♀ 4 mm., 1 ovig. ♀ 5 mm.

DISTRIBUTION. Atlantic, 0°–2½° N; Red Sea; Indian Ocean, 6° N, 73° E; South of Australia, 48° 18′ S, 130° 4′ E.

Vibilia armata, Bov.

Behning, 1913, p. 220; 1925, p. 491, figs. 52–61 (synonymy); 1927, p. 119.
Stephensen, 1918, p. 46, figs. 15, 16, chart 6.
Barnard, 1930, p. 404.

Occurrence: 1. St. 4. Tristan da Cunha. 1 ♀ 8 mm., 7 juv. 3–6 mm., from stomach of Blue Fish, "*Perca antarctica*".
2. St. 71. South-west Atlantic. 1 ♂ 8 mm.
3. St. 78. South Atlantic. 6 ♂♂ 7–8 mm., 28 ♀♀ 7–8 mm., 3 juv. 5–6 mm.

4. St. 81. South Atlantic. 1 ♂ 8 mm.
5. St. 87. South-east Atlantic. 10 ♂♂ 6–7 mm., 5 ♀♀ 6–7 mm., 4 juv. 4–6 mm. (1 ♀ ovig., 1 ♀ with embryos).
6. St. 88. South-east Atlantic. 4 ♂♂ 6–7 mm., 1 ♀ 7 mm., 5 juv. 5–6 mm.
7. St. 89. South-east Atlantic. 13 ♂♂, 16 ♀♀ 6–7 mm.
8. St. 268. East mid-Atlantic. 2 ♂♂ 7–7·5 mm., 1 ♀ 6 mm.

REMARKS. Stephensen records breeding ♀♀ in January, February, and June to September; and young at all seasons.

DISTRIBUTION. Mediterranean; Atlantic, 53° N–43° S; Indian Ocean; Eastern Pacific.

Vibilia pyripes, Bov.

Behning, 1913, p. 221; 1925, p. 494, fig. 62.
Stephensen, 1918, p. 52, fig. 17, chart 5, and p. 53 (*grandicornis*).
Barnard, 1930, p. 405.

Occurrence: St. 71. South-west Atlantic. 5 ♂♂ 7–8 mm.

REMARKS. The maintenance of *grandicornis* (Chevreux, 1900, p. 131, pl. xvi, fig. 2) as a separate species seems very doubtful.

DISTRIBUTION. Tropical and sub-tropical Atlantic; Indian Ocean; Pacific.

Vibilia cultripes, Voss.

Vosseler, 1901, p. 121, pl. xi, figs. 6–18.
Behning, 1913, p. 222; 1925, p. 495, figs. 63–67; 1927, p. 119.
Stephensen, 1918, p. 53, fig. 18, chart 7.

Occurrence: 1. St. 6° 55′ N, 15° 54′ W. 1 ♂ 14 mm.
2. St. 81. South Atlantic. 1 ♀ 16 mm.
3. St. 256. South-east Atlantic. 2 ♂♂ 15 and 16 mm.
4. St. 268. East mid-Atlantic. 2 ovig. ♀♀ 11–12 mm.
5. St. 281. East mid-Atlantic. 1 ♂ 13 mm.
6. St. 285. East mid-Atlantic. 1 ♂ 14 mm.
7. St. 298. East mid-Atlantic. 1 ♀ 11 mm.

REMARKS. The eyes in the ♂♂ are unusually well developed, being almost contiguous on the top of the head. This development is even greater than in *macropis* and diminishes still further the value of one of the characters which is quoted as distinguishing the "Cyllopodidae" from the Vibiliidae.

DISTRIBUTION. Mediterranean; Atlantic, 49° N–6° S; Indian Ocean; Pacific.

Vibilia sp.

Occurrence: St. 268. East mid-Atlantic. 1 ♀ 10 mm. (damaged).

REMARKS. The identification of this damaged specimen is not at all certain. It is clearly distinct from the specimen of *viatrix*, with which it was caught, in the subrounded telson, the uropods, the somewhat gibbous forehead and the dactyls of peraeopods 1–4. It is larger than previous records of *gibbosa*, but may possibly be this species, which is known from the Atlantic between 30° N and 20° S (cf. Behning, 1927, p. 115).

Genus Cyllopus, Dana.

Barnard, 1930, p. 405.

Cyllopus magellanicus, Dana.

Barnard, 1930, p. 408 (references).

Occurrence:
1. St. 4. Tristan da Cunha. 1 ♂ 9 mm., 1 ♀ 6 mm., 1 juv. 4 mm., from stomach of Blue Fish, "*Perca antarctica*".
2. St. 32. South Georgia. 1 ♀ 10 mm.
3. St. 35. South Georgia. 1 ♀ with embryos 13 mm.
4. St. 36. South Georgia. 4 ♀♀ 14–15 mm. (2 ovig., 2 with embryos).
5. St. 37. South Georgia. 2 ♀♀ 10 mm.
6. St. 47. Falklands. 3 ♀♀ 8–10 mm.
7. St. 66. South-west Atlantic. 1 ♀ 9 mm.
8. St. 67. South-west Atlantic. 1 ♂ 9 mm., 1 ovig. ♀ 8 mm., 1 ♀ with embryos 9 mm., 1 juv. 4·5 mm.
9. St. 71. South-west Atlantic. 1 ♀ 7·5 mm.
10. St. 81. South Atlantic. 1 ♀ 6 mm.
11. St. 89. South-east Atlantic. 1 ♀ 7 mm.
12. St. 116. Bouvet Island. 1 ♀ with embryos 16 mm.
13. St. 208. South Shetlands. 2 ♂♂ 15 mm.
14. St. 239. South-west Atlantic. 2 ♀♀ 7 and 9 mm.
15. St. WS 38. South Georgia. 1 ♀ 16 mm.
16. St. WS 95. Between Falklands and South America. 10 ovig. ♀♀ 8–9 mm.

Remarks. The material is not very abundant, but there is a well-marked migration from the deeper waters to the upper layers during the night. Examples were caught in day hauls between the depths of 30 m. (8 a.m.; one example) and 45 m. (1 p.m.; four examples), and at 2000 m. During the night all examples were captured between 0 and 55 m., and none below that depth, though at several of the stations hauls from deeper water were made with suitable gear.

In size ♂♂ vary from 9–15 mm. and ovigerous ♀♀ from 8–16 mm., in both cases the larger sizes coming from higher latitudes. The ♂♂ are much rarer than the ♀♀. Females with ova and embryos were captured in March, April, May and November.

Only the ♂♂ (nos. 1, 8, 13) show the green or greenish-blue colour, all the ♀♀ being (as preserved) yellowish with red or red-brown eyes.

Distribution. South Atlantic from lat. 30° S; southern Indian and Pacific Oceans.

Cyllopus lucasii, Bate.

Bate, 1862, p. 306, pl. l, fig. 2.
Spandl, 1927, p. 175, fig. 12 (*antarcticus*).
Barnard, 1930, p. 409.

Occurrence:
1. St. 25. South Georgia. 17 ♀♀ 15–20 mm. (half sample).
2. St. 26. South Georgia. 3 ♀♀ 14–16 mm.
3. St. 32. South Georgia. 8 ♀♀ 15–18 mm.
4. St. 36. South Georgia (0–5 m.). 4 ♀♀ 14–16 mm.
5. *ditto* (90–0 m.). 6 ♀♀ 15–18 mm. (2 with uterine ova) (half sample).
6. St. 37. South Georgia. 4 ♀♀ 14–16 mm.

7. St. 38. South Georgia. 3 ♀♀ 15–18 mm.
8. St. 44. South Georgia. 8 ♀♀ 14–18 mm.
9. St. 169. South Orkneys. 1 ♀ 13 mm.
10. St. 208. South Shetlands. 1 ♀ 11 mm., 2 ♀♀ (with uterine ova) 16–17 mm.

REMARKS. In addition to the marked difference in shape between the 2nd joints of peraeopod 5 of this species and *magellanicus*, there is a submarginal keel running from the articulation of the 2nd joint with the body parallel with the front margin to the insertion of the 3rd joint; in *magellanicus* the outer surface of the 2nd joint is quite smooth.

Like *magellanicus* this species migrates to the upper layers during the night. There are no actually ovigerous ♀♀, and no ♂♂ in the collection; but several ♀♀ contain what seem to be uterine ova, and it would seem that the breeding season starts towards the end of April or in May.

This is a more southerly form than *magellanicus*, not being found north of lat. 53½° S.

DISTRIBUTION. South Georgia; 65° S, 80° E.

Family PARAPHRONIMIDAE

Bovallius, 1889, p. 22.
Vosseler, 1901, p. 94.
Stephensen, 1925 *a*, p. 246.

Genus Paraphronima, Claus.

Stebbing, 1888, p. 1335.
Bovallius, 1889, p. 23 (key to species).
Stephensen, 1924, p. 75.
Spandl, 1927, p. 165 (key to the two species nowadays recognized).

Stewart's paragraph (1913, pp. 253–254), stating that the ♂ has a longer mandibular palp than the ♀, is evidently misplaced as neither sex in this genus has a mandibular palp.

Paraphronima gracilis, Claus.

Stebbing, 1888, p. 1337, pl. clvii (*cuivis*).
Bovallius, 1889, p. 27, pl. ii, figs. 1–10.
Stewart, 1913, p. 253.
Stephensen, 1924, p. 75, chart 10.
Spandl, 1927, p. 165, fig. 6.

Occurrence: 1. St. 2° 20′ S, 12° 45′ W. 1 ♂ 5·5 mm.
2. St. 84. South-east Atlantic. 1 ♀ 6 mm.
3. St. 266. South-east Atlantic. 1 ♀ 7·5 mm.

DISTRIBUTION. Mediterranean; Atlantic, 42° N–35° S; Indo-Pacific.

Paraphronima crassipes, Claus.

Bovallius, 1889, p. 30, pl. ii, figs. 11–15; p. 33, pl. ii, figs. 16–40 (*clypeata*).
Stewart, 1913, p. 253.
Stephensen, 1924, p. 77, chart 10.
Spandl, 1927, p. 166.
Barnard, 1930, p. 409.

Occurrence: 1. St. 2° 20′ S, 12° 45′ W. 1 ♂ 6·5 mm.
2. St. 69. South-west Atlantic. 1 ♂ 10 mm.
3. St. 78. South Atlantic. 1 ♀ 10 mm.
4. St. 87. South-east Atlantic. 3 ♂♂ 8–9 mm., 2 ♂♂ (penult. instar) 8 mm., 3 ♀♀ 8–9 mm., 2 juv. 6 mm.
5. St. 89. South-east Atlantic. 3 ♂♂ 6–9 mm., 2 ♀♀ 7–8 mm.
6. St. 103. South-east Atlantic. 1 ♀ 17 mm.
7. St. 259. South-east Atlantic. 1 ♀ 14 mm. with embryos.
8. St. 268. South-east Atlantic. 1 ♂ 8 mm. (penult. instar).
9. St. 273. East mid-Atlantic. 1 ♂ 7 mm., 1 ♀ 12 mm. (ovigerous, but all ova lost out of pouch).
10. St. 287. East mid-Atlantic. 1 ovig. ♀ 11 mm.
11. St. 296. East mid-Atlantic. 1 ovig. ♀ 12 mm.

REMARKS. The colour of no. 3 is given as "Of a glassy transparency, with, on either side of head along lower edge, 12 vertical spindle-shaped scarlet spots, separating proximal ends of ommatidia. A few red chromatophores at bases of last three legs and between them".

The ♀ no. 6 appears to be a record for size; Bovallius gives 15 mm. as the largest size of ♀ *clypeata*, but the majority of recorded specimens are much smaller. It happens to come from the most southerly of the localities, but the material is scarcely extensive enough to suggest that the largest specimens are always to be found in the highest latitudes.

DISTRIBUTION. Mediterranean; Atlantic, 42° N–37° S; Pacific Ocean.

Family CYSTISOMATIDAE

Stebbing, 1888, p. 1317.
Bovallius, 1889, p. 39.
Woltereck, 1903, p. 447; 1904, p. 553.
Stephensen, 1918, p. 56.
Spandl, 1927, p. 170.

Genus **Cystisoma**, Guér.

Woltereck, 1903, p. 447; 1904 *b*, p. 553.
Barnard, 1916, p. 286.
Stephensen, 1918, p. 56 (key to species, and discussion of characters).
Spandl, 1927, p. 170.

According to the Nomenclatorial Rules, Stebbing's contention that *Cystisoma* must be retained in its original spelling, and is therefore distinct from *Cysteosoma* and *Cystosoma*, is perfectly just. Guérin's name stands as against *Thaumops*, W. Suhm, emend. *Thaumatops*, von Mrtns. (cf. also Spath, *Mem. Geol. Surv. India*, IX, pt. 3, p. 163, footnote, 1928).

Of this genus it may well be said that we describe specimens, not species. There are some ten or eleven nominal species, but the latest writers agree on the difficulty of finding suitable diagnostic characters to define the species.

The present collection contains 22 specimens, of which six are ♀♀, one is a ♂, and the rest are more or less immature. Valuable as this collection is, nevertheless it unfortunately helps us very little forward. Two forms are easily recognized and referred to already known forms. But with the hope of bringing a little more definiteness into the definitions of the species of this genus, I have subjected the descriptions of all known specimens to tabular analysis. The result scarcely justifies the time expended, but for what they may be worth I add a few notes and comments.

Firstly, as regards *C. longipes* (Bov.), which Bovallius instituted (1886) on one specimen, later (1889) called Specimen A (Indian Ocean) (Stephensen, 1918, p. 60). The fact that Bovallius later (1889) referred another specimen (B) to this same species, incorrectly as later authors have recognised, is no reason why he should be deprived of the authorship of the species. Woltereck (1903) clearly did not mean his *bovallii* to supersede *longipes*, to which he does not refer except under a different heading, and to state (p. 459) that he suspects *parkinsoni* to be a synonym of it. Later Stephensen discovered the type and paratype (specimens A and B) of Bovallius' *longipes* and found them to be different species; but he incorrectly used (1918, pp. 59, 60) Woltereck's name for the type (specimen A) of *longipes* "to avoid further complication". He has, however, accomplished exactly what he wished to avoid; clearly *longipes*, Bov., must stand, whatever happens to *bovallii*, Wolt.

C. bovallii is in fact a species insufficiently described by its original author, for the number of ventral spines is not stated. Unless Stephensen has examined the type specimen of *bovallii* (and he does not state that he has done so), the identification of the Thor specimens from Stations 61, 73, 76 with Woltereck's species is risky. On the other hand, if there are the same number of ventral spines as in *longipes*, then it would seem that *bovallii* is really only the female of *longipes*. The 'Valdivia' took 2 ♀♀ *bovallii* in the Atlantic, and the 'Thor' took 2 ♂♂ *longipes* in the Atlantic; with the exception of Bovallius' type specimen A neither *longipes* nor *bovallii* is recorded from the Indian Ocean.

I am unable to pronounce definitely on the status of *bovallii*, but wish to vindicate Bovallius' name *longipes*.

Secondly, *C. coalitum* (Wolt.) is another species which, as regards the number of mandibular spines, is inadequately described. If there is only one spine the resemblance to *fabricii*, Stebb., becomes remarkably close. The coalescence of the peraeon segments seems to be a character on which too much reliance should not be placed. I entirely agree with Stebbing's remarks (1888, p. 1319). It is certainly not always easy to determine beyond cavil the presence or absence of a suture. Bovallius found a suture between peraeon segments 1 and 2 in both the specimens he assigned to *longipes*, whereas Stephensen (1918, p. 60) says there are no sutures. Spandl (1927) has recorded a specimen of *magnum* in which he finds a faint but distinct line of articulation between the first two segments. In the 52 mm. long specimen from Discovery Station 81 the first two segments seem to be quite distinct. Probably it was some such (aberrant) specimen on which Bovallius founded *loveni*, but as the type specimen is apparently lost, and there is a discrepancy as regards the mandible (Stephensen, 1918, pp. 59, 60, footnote) we cannot correlate any of the more adequately known species with it.

Further, we may note that all four specimens with the antennae considerably longer than the head are males ("*longipes*" B; *parkinsoni* 'Challenger' F, and 'Thor' 72; and *latipes*), and that the linear outer rami of the uropods, which are longer than the inner rami, have only been found in fully adult females of *pellucidum*, with the exception of somewhat similar rami in the male "*longipes*" B.

In the character of the mandibular spines and the ventral spines we find an almost perfect sequence of numbers, thus:

Mandibular spines:

? 1 or 2 or rudimentary	*loveni*
1	*fabricii, pellucidum, magnum, parkinsoni*
2	*longipes, bovallii, latipes*
3	*africanum*
Number unknown	*coalitum*, "*spinosum*", *neptunus*

Ventral spines:

? 1 pair	*loveni*
2 pairs	*fabricii, coalitum*
3 „	no specimen known
4 „	two Discovery specimens
5 „	*magnum* (Woltereck's specimens), "*longipes*" B
5–6 „	*longipes, latipes*
6 „	*africanum, parkinsoni* ('Thor') *magnum* (Spandl)
5–7 „	*pellucidum*
8 „	*neptunus*
Number unknown	*bovallii, parkinsoni* ('Challenger' F)

One can thus realize how difficult it is to define the species, especially when one remembers that scarcely a dozen specimens of *pellucidum* have been adequately described, and of the other "species" considerably fewer.

Lastly, we may note that on one occasion the 'Valdivia' took 1 ♂, 1 ♀ *magnum* and 1 ♀ *fabricii* in one and the same haul. The 'Gauss' took 1 ♀ *magnum*, 1 ♀ *pellucidum* and 1 immature specimen in one haul. The 'Discovery' has taken 1 ♀ *pellucidum* together with 5 *fabricii* (2 ♀♀, 3 juv.); on another occasion 1 immature *pellucidum* together with 2 immature *fabricii*; and on another occasion 1 ♀ *fabricii* together with 1 immature *pellucidum*. In one small area in the North Atlantic, measuring 10° of latitude by 5° of longitude, the 'Thor' took three specimens of one species together with one each of four other species.

We may perhaps define the following species:

fabricii, Stebb. 1 mand. spine; 2 pairs ventr. spines; antennae arising close together, about equal to length of head.

coalitum (Wolt.). Mand. spine ?; 2 pairs ventr. spines; antennae close together, about equal to length of head; segments 1–4 fused. (Possibly to be united with *fabricii*.)

pellucidum (W. Suhm). 1 mand. spine; (4) 5–6 (7) pairs ventr. spines; antennae arising far apart, about equal to head.

parkinsoni, Stebb. 1 mand. spine; ? ventr. spines; antennae moderately far apart, longer than head.

magnum (Wolt.). 1 mand. spine; 5 pairs ventr. spines; antennae far apart (Woltereck's figure), shorter than head.

longipes (Bov.). 2 mand. spines; (5–) 6 pairs ventr. spines; antennae far apart, about length of head ('Thor', in type broken off short).

bovallii (Wolt.). 2 mand. spines; ? ventr. spines; antennae more or less equal to head. (Possibly = *longipes*.)

latipes (Steph.). 2 mand. spines; 5–6 pairs ventr. spines; antennae close together, longer than head; 2nd (1st free) joint of peraeopod 7 markedly pyriform.

africanum, Brnrd. 3 mand. spines; 6 pairs ventr. spines; antennae far apart, length ?.

Species insufficiently described: *loveni*, *neptunus*, "*spinosum*".

Cystisomids appear to be inhabitants of the deeper layers, as they are only captured when the apparatus is sunk to considerable depths (except the earliest known specimens, Woltereck, 1904, p. 562). But the exact depth is known only for a very few specimens. The 'Challenger' used no closing nets; we are uncertain about the Valdivia (Woltereck, 1904, p. 561) and the Gauss specimens. The 'Thor' (Stephensen, 1918, p. 70) obtained the majority (nine) of her specimens at 1000–2000 m., two at 2000–3000 m. and one at over 4000 m.

The 'Discovery' only obtained two specimens in closing nets, viz. at Stations 216 and 219 in 750–500 and 750–535 m.

As regards life-history various larval forms have been described (Woltereck, 1904; Senna, 1904; Stephensen, 1918; Spandl, 1927) and Woltereck, 1904, p. 526, inclines to the view that the adults rise to higher levels at certain seasons; but our data are yet far too meagre to determine whether there is any particular breeding season.

It may be interesting to note that fully adult females are recorded during the following months (latitude approximate):

magnum	'Valdivia'	4° S, Indian Ocean	9 March[1]
"	'Gauss'	35° S, Atlantic Ocean	16 November
pellucidum	'Challenger'	35° N, "	28 January
"	Plankton Exp.	North Sargasso Sea	19 October
"	'Gauss'	35° S, Atlantic Ocean	16 November
"	'Discovery'	41° N, "	10 October
"	"	13° N, "	28 October
"	"	5° N, "	25 August
fabricii	"	0° 46′ S, "	12 August
africanum	'Pieter Faure'	33° S, Indian Ocean	22 April

The collection of the 'Thor' was made during the months of February (one larva) and May, June and September, but no adult female was taken.

Our knowledge of the geographical distribution of the genus has been considerably extended by the Discovery captures. The most southerly records hitherto known were:

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[1] This is the only ♀ that Woltereck *explicitly* states (and figures) to be "ripe", i.e. with enlarged 6th joint to peraeopod 5.

33° S, 17° E (*coalitum*, 'Valdivia'); 33⅓° S, 28° E (*africanum*, 'Pieter Faure'); and 35½° S, 8° E (*magnum* and *pellucidum*, 'Gauss'). The 'Discovery' has extended the known southerly limit to 57–58° S (Drake Strait) for the species *fabricii*.

Cystisoma pellucidum (W. Suhm).

Stephensen, 1918, p. 64, figs. 19, 24–27.

Occurrence: 1. St. 41° 37′ N, 12° 30′ W. 1 adult ♀ 66 mm. (incl. uropods 75 mm.).
2. St. 13° 25′ N, 18° 22′ W. 1 ♀ probably about 70 mm. (pleon and uropods missing).
3. St. 6° 55′ N, 15° 54′ W. 1 immat. 40 mm.
4. St. 78. South Atlantic. 1 juv. 11 mm.
5. St. 281. East mid-Atlantic. 1 immat. 30 mm.
6. St. 295. East mid-Atlantic. 1 adult ♀ 70 mm. (incl. uropods 85 mm.).

REMARKS. There are five pairs of ventral spines, except in no. 1 where there are five spines on the left side, six on the right, and in nos. 2 and 4 where there are only four pairs. Nos. 1 and 6 have the elongate outer rami to the uropods and the enlarged antennae and 6th joint to peraeopod 5. The antennae are about the same length as the head, except in no. 2 where they are distinctly shorter (13 : 20); they are 6 mm. apart, except in no. 3 where they are only 3 mm., the antennae and head of the latter both measuring 11 mm., and in no. 4 where they are 2 mm. long and 1 mm. apart.

A remarkable feature of nos. 1 and 6 is the presence of numerous minute Copepods within the body; they occur in all parts of the body, in no. 1 even within the peduncles of the pleopods and the basal (2nd) joints of peraeopods 4 and 7. Their presence has not been noticed by other authors, and they are not present in *africanum* (which I have re-examined), or the other large Discovery ♀ no. 2. The only explanation I have to suggest is that nos. 1 and 4 were "spent" ♀♀ and were mere dead skins when captured, the minute Copepods having entered the bodies in the rôle of scavengers.

Whether W. Suhm's species should be identified with "*spinosum*" of Fabricius and/or Guérin is impossible to say, and it seems best to drop the name "*spinosum*" altogether.

DISTRIBUTION. North Atlantic, 48°–35° N; Indian Ocean, 0° 58′–4½° S. 1280–4000 m.

Cystisoma fabricii, Stebb.

Stephensen, 1918, p. 63, figs. 22, 23.

Occurrence: 1. St. 13° 25′ N, 18° 22′ W. 2 ♀♀ 65 and 66 mm. (incl. uropods 72 and 76 mm.), 3 immat. 34, 40, and 48 mm.
2. St. 6° 55′ N, 15° 54′ W. 2 immat. 25 and 40 mm.
3. St. 71. South-west Atlantic. 1 immat. 35 mm.
4. St. 81. South Atlantic. 1 ♂ 52 mm. (no genital papillae or median ventral spine).
5. St. 216. Drake Strait. 1 juv. 21 mm.
6. St. 219. Drake Strait. 1 juv. 23 mm.
7. St. 276. East mid-Atlantic. 1 juv. 17 mm.
8. St. 281. East mid-Atlantic. 1 ♀ 70 mm.
9. St. 287. East mid-Atlantic. 1 immat. 38 mm.
10. St. 297. East mid-Atlantic. 1 immat. 31 mm., 1 juv. 13 mm.

REMARKS. In all these specimens the antennae are about as long as the head, sometimes a little less, sometimes a little more; except in one specimen of no. 1 where they are considerably longer (head 11 mm., antennae 20 mm., total length 48 mm.); they always arise close together, never more than 1·5 mm. apart in the largest specimens. The number of ventral spines is constant (two pairs).

No. 5 is noted as being "completely transparent". Woltereck (1903, p. 452) found rows of regularly spaced chromatophores on the edges of the peraeopods and the dorsal keels.

Nos. 3, 4, and especially 5 and 6, extend the known distribution far to the south.

DISTRIBUTION. North Atlantic, 50° N; Indo-Pacific (Zanzibar and East Indies), 4° N–10° S. 900–2200 m.

Family HYPERIIDAE

Bovallius, 1889, p. 74 (key to genera).
Stephensen, 1924, p. 78.
Spandl, 1927, p. 151 (key to genera).

Genus **Hyperia**, Latr.

Bovallius, 1889, p. 129 (key to species).
Vosseler, 1901, p. 56.
Spandl, 1927, p. 153.

Hyperia galba, Mont.

Barnard, 1916, p. 285 (*gaudichaudii*) (literature); 1930, p. 411.
Stephensen, 1924, p. 81, chart 11.
Spandl, 1927, p. 153.

Occurrence: 1. St. WS Hoetjes Bay, South Africa. 1 adult ♂ 12 mm., 2 ♂♂ (penult. instar) 11 mm., 4 ♀♀ 8–11 mm., from Medusae.
2. St. WS 95. Between Falklands and South America. 1 ♂ (penult. instar) 9 mm., 12 ♀♀ 8–10 mm. (the larger ovig.).

REMARKS. In the Terra Nova Report I maintained that *gaudichaudii* was not separable from *galba*, and further that *spinigera* and *antarctica* were also synonymous. Since, however, I have seen the specimens in the present collection which are obviously referable to the form *spinigera*, I am of opinion that *spinigera* ought to be kept separate from *galba*.

DISTRIBUTION. Mediterranean; North Atlantic, southwards to 17° N; South Atlantic, northwards to 26½° S; Arctic and Antarctic Oceans; Indo-Pacific.

Hyperia spinigera, Bov. (Fig. 160).

Bovallius, 1889, p. 191, pl. x, figs. 33–39.
Norman, 1900, p. 128 (*galba* part).
Tattersall, 1906, p. 22.
Stephensen, 1924, p. 81 (*galba* part).
Spandl, 1927, p. 153, fig. 2 (*antarctica*).

Occurrence: 1. St. 36. South Georgia. 1 ♂ 22 mm. (mutilated).
2. St. 298. East mid-Atlantic. 1 ♂ 20 mm., 1 ovig. ♀ 15 mm.

Remarks. Firstly, it seems reasonable to assume that the ♀ and ♂ of no. 2 are conspecific, though it is not certain. The most striking feature of both is the very broad peduncles and inner rami of uropods 2 and 3; that of the ♂ agrees with Bovallius' figure of a ♂. Both specimens further agree with one another in the 2nd gnathopods, though the spines are rather stronger in the ♂, and in having the postero-inferior angle of pleon segment 3 rounded.

Apparently the only known ♀ specimens are those reported by Norman (1900) who says that according to the 1st and 2nd gnathopods both sexes belong to the *spinigera* form. The present ♂ of no. 2 has the 1st gnathopod as in Bovallius' fig. 34; but the ♀ has the antero-inferior angle of the 5th joint more rectangular, and with fewer and weaker spines on the 4th–6th joints, in fact quite like that of *latreillei* as figured by Bovallius (pl. x, fig. 4).

With these specimens before me, I see no other course than to follow Tattersall in maintaining Bovallius' species as distinct from *galba*.

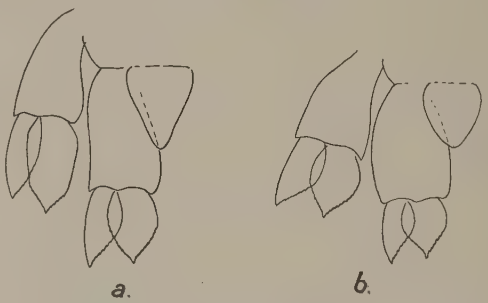

Fig. 160. *Hyperia spinigera*, Bov. Uropods 2 and 3, and telson of *a* ♂, *b* ♀.

Bovallius regarded *spinigera* as an Arctic form, and the most southerly locality yet recorded is the south coast of England. The present specimens extend the known distribution very far to the south.

It would seem that *antarctica* is synonymous with *spinigera* rather than with *galba*, although one cannot be sure because Spandl merely said the uropods were completely unarmed and showed "keinerlei charakteristische Form". It is just the characteristic form of the uropods which induces me to maintain the distinctness of *spinigera*.

Distribution. Spitsbergen; Labrador; West of Ireland; South coast of England; Antarctic (*antarctica*).

Genus **Hyperiella**, Bov.

Stebbing, 1888, p. 1403.
Bovallius, 1889, p. 241.
Spandl, 1927, p. 161.

Hyperiella dilatata, Stebb.

Stebbing, 1888, p. 1403, pl. clxxi (♀).
Spandl, 1927, p. 162, fig. 5 (♂).
Barnard, 1930, p. 413.

Occurrence: St. 116. Bouvet Island. 11 ♀♀ 4–6 mm.

Remarks. In the Terra Nova Report it was stated that this species appeared to be a more Antarctic species than *antarctica*, as only one of the recorded localities lay north of lat. 60° S. The present record constitutes a further exception. The accompanying chart shows the recorded distribution of the two species, including the present records.

Distribution. See chart, Fig. 161.

Hyperiella antarctica, Bov.

Bovallius, 1889, p. 242, pl. xi, figs. 42–51.
Stewart, 1913, p. 256.
Barnard, 1930, p. 414.

Occurrence: 1. St. MS 2. South Georgia. 1 ♂ 6 mm.
2. St. MS 22. South Georgia. 1 ♀ 5·5 mm.
3. St. MS 25. South Georgia. 1 ♀ 5 mm.
4. St. MS 26. South Georgia. 1 ♀ with embryos 7 mm.
5. St. MS 40. South Georgia. 1 ovig. ♀ 7 mm.

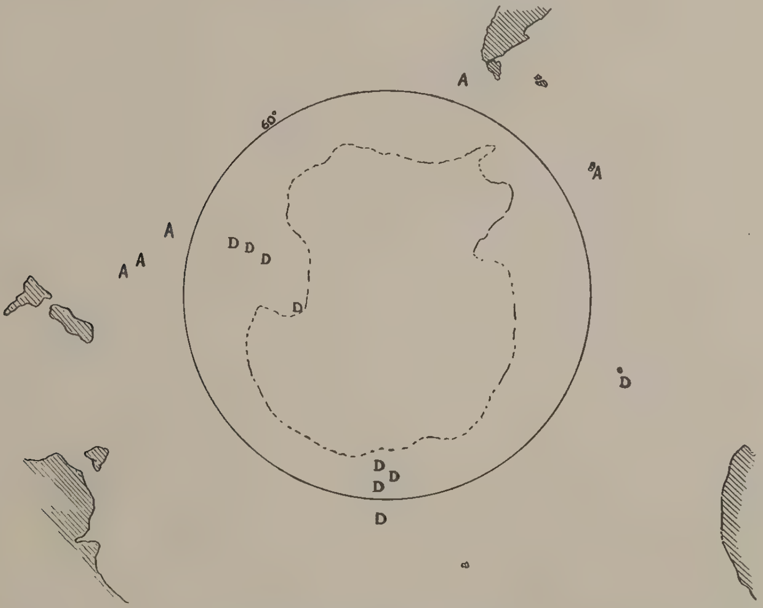

Fig. 161. Chart of the South Polar region to show distribution of *Hyperiella*: A = *antarctica*, D = *dilatata*.

Remarks. As noted by Stewart and Barnard the points on the pleon segments 1–3, and on the distal front angle of the 2nd, 3rd and 4th joints in peraeopods 3–5 are sometimes present in this species, though not as well developed as in *dilatata*.

Distribution. See chart, Fig. 161.

Genus **Hyperioides**, Chevr.

Chevreux, 1900, p. 143.
Vosseler, 1901, p. 56 (*Parahyperia*).
Stebbing, 1904, p. 34.

Hyperioides longipes, Chevr.

Chevreux, 1900, p. 143, pl. xvii, fig. 2.
Stebbing, 1904, p. 35.
Stewart, 1913, p. 256.
Chevreux and Fage, 1925, p. 407, fig. 405.
Barnard, 1930, p. 414.

Occurrence: 1. St. 84. South-east Atlantic. 1 ♀ 4·5 mm.
2. St. 87. South-east Atlantic. 1 ovig. ♀ 6 mm., 2 ♀♀ 5–6 mm.
3. St. 88. South-east Atlantic. 2 ♀♀ 5·5 mm.
4. St. 89. South-east Atlantic. 1 ♂ (antepenult. instar) 4·5 mm., 1 ♂ (penult. instar) 5 mm., 6 ♀♀ 5–6 mm.

DISTRIBUTION. Mediterranean; Atlantic, 51° N–37½° S; New Zealand Seas.

Genus **Hyperoche**, Bov.

Bovallius, 1889, p. 83.
Senna, 1908, p. 154.
Barnard, 1930, p. 415.

Hyperoche medusarum (Kröy.).

Stephensen, 1924, p. 79.

Occurrence: 1. St. 125. South Georgia. 2 ♂♂ 10 and 13 mm.
2. St. 130. South Georgia. 1 ♀ 9 mm.
3. St. MS 30. South Georgia. 1 juv. ♀ 7 mm.

REMARKS. A species which seems to keep to the upper layers, rarely being found below 250 m. (Stephensen, p. 79). Stephensen erroneously quotes Tattersall (1906) to the effect that it is rarely "encountered at depths greater than 1000 fathoms", whereas Tattersall really says "It would appear to be a wholly littoral and sublittoral form rarely extending outside the 1000-fathoms line".

It is extremely interesting to find this boreo-Arctic species appearing in the South Georgia area, and likewise in the upper layers not far from land. The only other species of the genus hitherto found in Antarctic and sub-Antarctic waters are:

luetkenides, Wlkr.	South of Australia
capucinus, Brnrd.	South-west of Cape Horn and in Ross Sea
cryptodactylus, Stebb.	Off Cape of Good Hope

DISTRIBUTION. North Atlantic and adjacent seas, about 50°–77° N; North of Alaska.

Genus **Pegohyperia**, Brnrd.

Barnard, 1931, p. 429.

Integument indurated, firm (πηγος). Eyes apparently without ocelli or facets. Side-plates uneven, 1, 2, 6 and 7 shallow, 3–5 much deeper. Pleon not abruptly narrower than peraeon (in ♀).

Antenna 1 with large laminate flagellum. Antenna 2 well developed (♀). Mandible with "molar" projection laminate as in *Hyperoche*, and well-developed palp. Maxilla 1 with large laminate palp.

Gnathopods 1 and 2 with 5th joint apically produced, compressed, knife-like. Peraeopods 3–5 with 2nd joint rather broadly expanded.

Peduncles of uropods 1–3 stout, not elongate.

Remarks. The very striking specimen for which this genus is proposed evidently has relationships with *Hyperoche*, as for instance in the mouth-parts and gnathopods.

Without sectioning it is impossible to say whether the "eyes" are normal functioning eyes or not; it seems possible that they may be composed only of the receptive elements and serve to reflect or intensify light rays from other sources, though no pearly reflector seems to be present (cf. Woltereck, 1909, p. 164 *sqq*.).

The enlargement of the flagellum of antenna 1 may be correlated with the simplification (if any) of the eyes.

Dr Kemp informs me that during the cruise of 'Discovery II' a second specimen of this interesting form was captured, but the specimen has not been submitted to me as yet.

Pegohyperia princeps, Brnrd. (Figs. 162–164 and Plate I, figs. 5, 5 *a*).

Barnard, 1931, p. 430.

Occurrence: St. 85. South-east Atlantic. 1 ♀ with embryos 28 mm.

Description of ♀. Integument firm and indurated, shagreened and minutely punctate all over. Head moderately enlarged, the lower anterior margin produced into

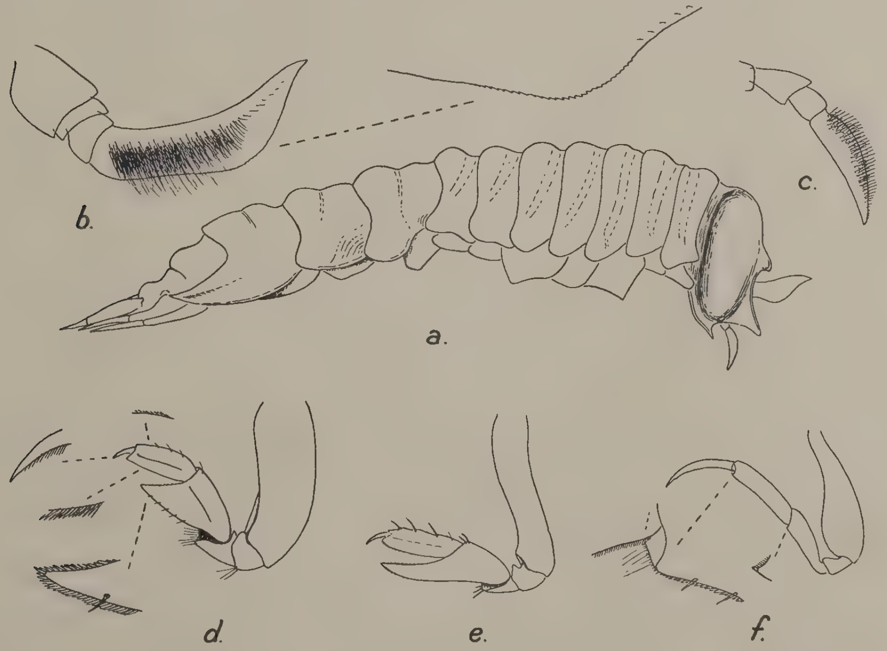

Fig. 162. *Pegohyperia princeps*, Brnrd. *a*. General view. *b*. Antenna 1 with lower margin of flagellum further enlarged. *c*. Antenna 2. *d*. Gnathopod 1, with portions of margins further enlarged. *e*. Gnathopod 2. *f*. Peraeopod 1, with portions of margins further enlarged.

two points, the anterior one larger than the other; a prominent rounded knob projecting between the "eyes", hollow beneath, and arching over the bases of 1st antennae; a distinct though shallow neck behind the "eyes"; free margin of the head costate, the costa more prominent on the postero-inferior margin, and on the anterior margin of the larger projecting point and the lower margin of the frontal knob.

The surface of the "eyes" is shagreened like the rest of the body, and no trace of ocelli or facets is visible. The front portion of the ocular lobes is dull reddish-brown, darker in colour than the rest of head (cf. coloured reproduction of sketch taken from life).

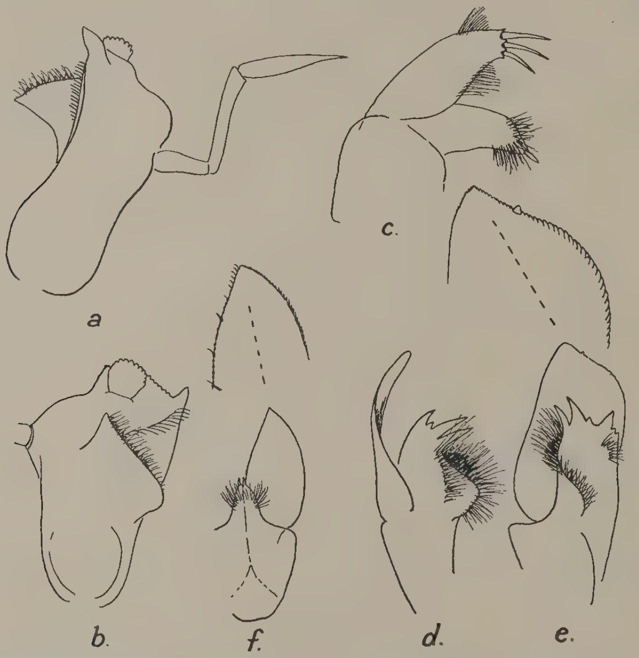

Fig. 163. *Pegohyperia princeps*, Brnrd. *a*, *b*. Two views of left mandible (palp omitted in *b*). *c*. Maxilla 2. *d*, *e*. Two views of maxilla 1, with distal margin of palp further enlarged. *f*. Maxilliped, with apex of outer plate further enlarged.

Peraeon segments subequal, each with a transverse dorsal and dorso-lateral shallow groove and raised rounded ridge; on segment 1 the ridge precedes the groove, on the other segments the groove is in front of the ridge, which is specially prominent on segments 5–7; the dorsal profile is therefore undulate. Postero-inferior angles on all segments rounded; antero-inferior angles on segment 1 slightly, on segments 6 and 7 more prominently produced forwards, but not acute. Side-plates 1 and 2 shallow, slightly produced forwards as rounded lobes, both with a horizontal keel above and overhanging the insertions of the gnathopods. Side-plates 3–5 considerably deeper, 3 projecting outwards, 3 and 4 quadrangular, 5 triangular. Side-plates 6 and 7 shallow.

Pleon broad, not abruptly narrower than peraeon, dorsal profile undulating; pleural portions of segments 1–3 each with an oblique keel which forms the lower margin of the posterior half of each pleuron; segment 4 (in dorsal view) wider than long; segments 5 and 6 completely fused, with a notch on lateral margin. Telson longer than wide, extending to three-quarters of peduncle of uropod 3, ovate-lanceolate, tapering rather rapidly to the acute apex.

Antenna 1, flagellum very large, thin, laminate, apex acute and upturned, lower margin arcuate and very minutely serrulate, inner surface with a band of dense, very fine setae. Antenna 2, flagellum ensiform, upper margin with numerous fascicles of setae.

Epistome gibbous. Upper lip bilobed (somewhat asymmetrically). Mandible, cutting edge with rounded denticles, and ending in a tooth at posterior corner; secondary cutting plate in left mandible only, subcircular, also with rounded denticles; the "molar" projection thin, laminate, its margin with spinules and setae; palp with 3rd joint subequal to 2nd, all the joints smooth. Maxilla 1, inner lobe wanting, outer lobe strong, twisted, its distal margin with two strong teeth, then a small one, then a moderately large one, followed by two small ones, setae arranged as in figure, palp large, laminate, curved, ovate, its distal margin minutely denticulate. Maxilla 2, inner lobe with a single apical spine, and a subapical dense whorl of setae, outer lobe with three strong apical spines, and some setae on inner and outer margins. Maxilliped, inner plates completely fused into a conical projection tipped with two spinules, and a subapical patch of setae; outer plates ovate, inner margin minutely serrulate.

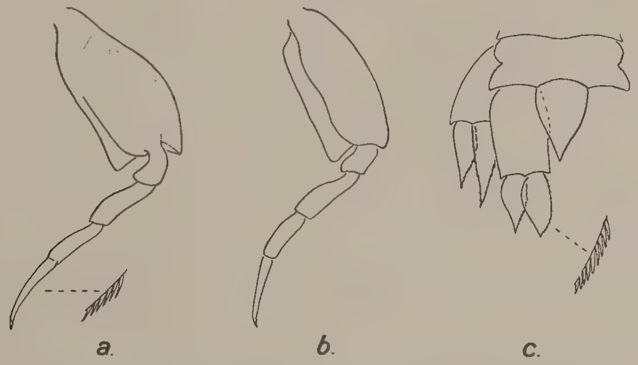

Fig. 164. *Pegohyperia princeps*, Brnrd. *a*, *b*. Peraeopods 3 and 5. *c*. Uropods 2, 3 and telson.

Gnathopod 1, 5th joint triangularly expanded, laminate, apex reaching three-quarters along 6th joint, upper and lower margins finely pectinate, 6th narrow ovate, lower margin pectinate, a low longitudinal ridge on outer surface. Gnathopod 2 similar to gnathopod 1, but more slender, the produced apex of 5th joint reaching to end of 6th.

Peraeopods 1 and 2 similar to one another, but the 2nd joint in the 2nd not so markedly flask-shaped as in the 1st, 4th and 5th joints subequal, 6th longer, lower margins of 5th and 6th minutely pectinate. Peraeopods 3 and 4 a little longer than peraeopods 1 and 2, similar to one another, but 2nd joint in 4th not so wide distally, 4th and 5th joints subequal, 6th longer, lower margin of 6th minutely pectinate, and a few similar pectinations on lower apical angle of 5th joint in peraeopod 4. Peraeopod 5 shorter than peraeopods 3 and 4, subequal to peraeopods 1 and 2, 2nd joint similar to that of peraeopods 3 and 4 but more ovate, being wider at base, and the longitudinal keel extends right to base, 5th shorter than 4th, 6th longer than 4th, lower margin of 6th minutely pectinate, and a few pectinations on lower apical angle of 5th. Dactyls of peraeopods 1–5 all slender, and there appear to have been a few pectinations on their inner margins near base, but most of them are broken or rubbed off.

Pleopods, peduncles very stout, quadrangular in cross-section.

Uropods 1 and 2, peduncle stout, extending about one-third length of peduncle of uropod 3, rami narrow lanceolate, the inner subequal to peduncle, the outer a little shorter, outer margin of peduncle of uropod 1 minutely serrulate, of uropod 2 smooth. Uropod 3, peduncle stout, about twice as long as broad, upper surface with a low longitudinal ridge, margins smooth, rami ovate-lanceolate, the inner a trifle longer than outer. Margins of all rami of all uropods minutely serrulate, except outer margin of outer ramus of uropod 2 and outer margins of both rami of uropod 3.

REMARKS. The beautiful and remarkable violet coloration of this species is well shown in the figures on Plate I, reproduced from sketches made immediately after capture.

Genus **Parathemisto**, Boeck.

Stebbing, 1888, p. 1407 (*Euthemisto*) and p. 1419.
Bovallius, 1889, p. 248 (key to species) and p. 275 (*Euthemisto*, key to species).
Stephensen, 1923, p. 19 (*Themisto*, key to European species); 1924, p. 95 (*Themisto*).
Mogk, 1926, p. 65 (*Themisto*, analysis of *compressa-bispinosa* differences).
Barnard, 1930, p. 419 (synopsis of species).

Parathemisto (Euthemisto) gaudichaudii (Guér.).

Cunningham, 1871, p. 498 (*Themisto antarctica* Dana).
Bovallius, 1889, p. 229, text-figs. 1–5; pl. xiii, figs. 44–46.
Vosseler, 1901, p. 81, fig. 2; pl. viii, figs. 11–17 (*compressa*) and p. 84, fig. 3; pl. viii, figs. 3–10 (*bispinosa*).
Stewart, 1913, pp. 256, 257.
Stephensen, 1923, p. 27, chart 6 (*compressa*); 1924, p. 103, figs. 43–49 (*compressa* and *bispinosa*).
Barnard, 1925, p. 374; 1930, p. 420.
Chilton, 1925, p. 180; 1926, p. 512.
Mogk, 1926, p. 65 (*compressa* and *bispinosa*).
Spandl, 1927, p. 165 (*bispinosa*).

Occurrence: 1. St. 8. South Atlantic. 23 ♀♀ 14–16 mm. (half sample).
2. St. 9. South Atlantic (0–1250 m.). 23 ♀♀ 10–17 mm.
3. St. 24. South Georgia. 24 ♀♀ 11–19 mm. (half sample).
4. St. 26. South Georgia. 1 juv. 8 mm., 12 ♀♀ 13–16 mm.
5. St. 33. South Georgia. 14 ♀♀ 14–19 mm.
6. St. 35. South Georgia. 7 ♀♀ 14–17 mm.

7. St. 36. South Georgia (0–5 m.). 21 ♀♀ 14–16 mm. (half sample).
8. *ditto* (90–0 m.). Many ♀♀ 13–17 mm.
9. St. 41. South Georgia (100–50 m.). 17 ♀♀ 15–17 mm. (half sample).
10. *ditto* (250–150 m.). 10 ♀♀ 13–17 mm. (half sample).
11. St. 47. Falklands. 4 ♀♀ 17–20 mm., 6 ♀♀ 11–14 mm.
12. St. 49. Falklands. 1 ♀ 20 mm.
13. St. 51. Falklands. 8 ♀♀ 10–13 mm., 1 ♀ 19 mm., many juv. 2·5–4·5 mm.
14. St. 71. South-west Atlantic. 9 ♀♀ 12–15 mm., 1 ♀ 20 mm.
15. St. 72. South-west Atlantic. 2 ♀♀ 14 and 15 mm.
16. St. 78. South Atlantic. 2 ♂♂ 15 and 17 mm.
17. St. 101. South-east Atlantic (1310–1410 m.). 1 ♂ 11 mm.
18. St. 116. Bouvet Island. 2 ♀♀ 16 mm. (1 ovig.).
19. St. 120. South Atlantic. 3 ♂♂ 13–14 mm.
20. St. 125. South Georgia. Many juv. 3–6 mm.
21. St. 128. South Georgia. 4 juv. 4–5 mm.
22. St. 132. South Georgia. 1 ♀ 17 mm., 1 juv. 10 mm.
23. St. 136. South Georgia. Many juv. 5–9 mm.
24. St. 137. South Georgia. 2 ♀♀ 16 mm., 1 ovig. ♀ 20 mm., a lot juv. 6–9 mm.
25. St. 151. South Georgia. 7 ♀♀ 8–12 mm.
26. St. 180. Palmer Archipelago (160–330 m.). 19 ♀♀ 14–16 mm.
27. St. 208. South Shetlands. 10 ♀♀ 16–17 mm.
28. St. 239. South-west Atlantic. 20 ♀♀ 17–25 mm.
29. St. WS 38. South Georgia. 1 ovig. ♀ 16 mm., 33 juv. 6·5–10 mm.
30. St. WS 69. Falklands. 1 ovig. ♀ 25 mm.
31. St. WS 72. Falklands. 1 ♀ 9 mm.
32. St. WS 89. South America. 16 ♀♀ 11–16 mm.
33. St. WS 95. Between Falklands and South America. Many ♀♀ 14–17 mm.
34. St. WS 99. Falklands. Many, more or less damaged, from stomach of *Merluccius* sp.
35. St. MS 36. South Georgia. 2 ♀♀ 16 mm. (1 with embryos).
36. St. MS 39. South Georgia. 2 ♀♀ 16 mm. (1 with embryos).

REMARKS. There are about 300 ♀♀ and only 6 ♂♂ in the present collection (cf. Vosseler, p. 87). Both forms *compressa* and *bispinosa* occur together, but the latter seems to be slightly more abundant, and also to prefer higher latitudes, not being found north of 41° S, whereas the former was found about 34° S (off Cape Town). This points to the same conclusion as Vosseler drew (p. 86), based on a single specimen found at 7° S, that f. *compressa* is more eurythermous than f. *bispinosa*.

Both sexes of both forms are present. On no occasion were the two sexes taken together. The ♂♂ measure 11–17 mm.; ovigerous ♀♀ 16–20 mm.; the largest ♀ is 25 mm.

The largest specimens are mostly f. *compressa* with the dorsal teeth and the lateral projections on epimera 5 and 6 in ♀ very well developed.

Breeding takes place in the southern spring and summer, ovigerous ♀♀ being caught in November, December and February, and on two occasions (nos. 1 and 2) ♀♀ with embryos in October.

The present collection affords no evidence of a day-night bathymetrical migration. Specimens were obtained at night only in the upper layers (about 100–0 m.); but this is negative evidence, because on these occasions no deep hauls were made, or only vertical hauls, and vertical hauls are not productive. On the other hand, specimens occurred abundantly in the upper layers, even to quite near the surface, during the day.

The form *thomsoni*, with the apex of the peduncle of the 1st uropod not extending to the apex of the peduncle of the 2nd, occurred amongst both *compressa* and *bispinosa*, noticeably in nos. 17 and 30 (St. 72 and 239, on the track between the Falkland Islands and Tristan da Cunha). Also at two stations (St. 9 and 239: between Tristan da Cunha and South Georgia, and north-east of the Falkland Islands) the *bispinosa* specimens were noticeable for the length of the 6th joint of the 3rd peraeopod and of the 3rd uropods, being exact counterparts of Guérin's figure and Dana's figure of *antarctica* (cf. facsimiles in Bovallius, 1889, pp. 299 and 294 resp.).

As regards the synonymy it seems that the union of *gaudichaudii*, *antarctica*, *thomsoni*, *compressa* and *bispinosa* under the one name is undoubtedly right. Vosseler stated that the name *gaudichaudii* should be used, but Stephensen ignores Guérin's right of priority. Strictly speaking *bispinosa* should give place to *antarctica* as a designation for one of the two forms. Perhaps this latter is too drastic a change for northern naturalists; certainly the use of a geographical appellation is not very desirable, though the terms *compressa* and *bispinosa* do not express the real contrast between the two forms.

DISTRIBUTION. North Atlantic about 40°–76° N (the Plankton Expedition obtained one *compressa* at 7° S and one *bispinosa* at 31½° N); South Atlantic, 35°–68° S; southern Indian Ocean, 40°–50° S; Australasian Region, 48°–63° S. The occurrence in lower latitudes off Cape Town (34° S) is evidently due to the cold west drift current.

Family DAIRELLIDAE

Bovallius, 1889, p. 331.
Vosseler, 1901, p. 50.

Genus **Dairella**, Bov.

Bovallius, 1889, p. 332 (key to the two species).
Stephensen, 1924, p. 112.

Dairella latissima, Bov.

Stebbing, 1888, p. 1343, pl. clviii.
Bovallius, 1889, p. 336, pl. xv, figs. 1–20.
Stewart, 1913, p. 254.
Stephensen, 1924, p. 112.

Occurrence: St. 89. South-east Atlantic. 2 ♂♂ 6 mm. (penult. instar).

DISTRIBUTION. Mediterranean; Atlantic, 57° N–37½° S.

Family PHRONIMIDAE

Genus **Phronima**, Latr.

Stebbing, 1888, p. 1346.
Vosseler, 1901, p. 1.
Stephensen, 1924, p. 113 (key to species and note on vertical migrations).
Mogk, 1926, p. 160 *sqq.*
Dudich, 1926, p. 117.

Phronima sedentaria (Forsk.).

Vosseler, 1901, p. 14; pl. i, figs. 1–11.
Stephensen, 1924, p. 114, figs. 50, 51, chart 15.
Mogk, 1927, p. 127, chart 1.
Barnard, 1930, p. 422.

Occurrence: 1. St. 29° 26′ N, 15° 07′ W. 3 ♀♀ 10–14 mm.
2. St. 17° 45′ N, 18° 15′ W. 4 mutilated ♀♀, about 15–18 mm., from stomach of *Thynnus pelamys*.
3. St. 13° 25′ N, 18° 22′ W. 1 ♀ 28 mm. in house, with juv. in 3rd instar; 1 ♀ 33 mm. in house, with juv. in 3rd and 4th instars.
4. St. 2° 20′ S, 12° 45′ W. 1 ♂ 7 mm., 8 ♀♀ 9–18 mm.
5. St. 3° 50′ S, 12° 54′ W. 1 ovig. ♀ 17 mm.
6. St. 3. South Atlantic. 1 ♀ 29 mm. in house.
7. St. 4. Tristan da Cunha (0–10 m.). 1 ♀ 31 mm.
8. *ditto*. 1 ♀ 21 mm. from stomach of "*Perca antarctica*".
9. St. 62. South-west Atlantic. 1 ♀ 17 mm.
10. St. 71. South-west Atlantic. 1 ♀ 25 mm. in house.
11. St. 72. South-west Atlantic. 3 ♀♀ 22–25 mm. with three houses.
12. St. 76. South-west Atlantic. 1 ♀ 26 mm. in house, with juv. in 2nd instar.
13. St. 81. South Atlantic. 3 ♀♀ 20–32 mm. in houses; numerous juv. in 4th and 5th instars loose in bottle.
14. St. 85. South-east Atlantic. 3 ♀♀ 21–23 mm., two in houses, one loose.
15. St. 86. South-east Atlantic. 1 ♀ 18 mm.
16. St. 88. South-east Atlantic. 1 ♀ 28 mm. in house.
17. St. 101. South-east Atlantic (2480–2580 m.). 2 ♀♀ 17 and 25 mm.
18. *ditto* (350–400–0 m.). 1 ovig. ♀ 31 mm., 1 ♀ 29 mm. with juv. in 1st instar in brood pouch; 7 ♀♀ 17–30 mm.
19. *ditto* (850–900 m.). 4 ♀♀ 15–17 mm.
20. St. 239. South-west Atlantic. 7 ♀♀ 16–26 mm. and four houses. In one house juv. in 3rd instar, in another juv. in 2nd instar.
21. St. 250. South Atlantic. 4 ♀♀ 22–27 mm. with houses; 1 ♀ 26 mm. with juv. in 1st instar in brood pouch. One house with juv. in 3rd instar, another with juv. in 4th instar.
22. St. 254. South-east Atlantic. 5 ♀♀ 20–30 mm. and five houses. In one house juv. in 3rd and 4th instars.
23. St. 256. South-east Atlantic. 1 ♂ 9 mm.
24. St. 268. Portuguese West Africa. 6 ♂♂ 8–10 mm., 8 ♀♀ 9–12 mm., 9 ♀♀ 20–24 mm. One house with juv. in 1st instar.
25. St. 273. Portuguese West Africa. 2 ♀♀ 16 and 22 mm.
26. St. 281. East mid-Atlantic. 2 ♀♀ 20 and 22 mm.
27. St. 285. East mid-Atlantic. 48 ♀♀ 20–30 mm. with houses; 1 ovig. ♀ 27 mm., 2 ♀♀ 12 and 18 mm., two houses with juv. in 2nd instar.
28. St. 297. East mid-Atlantic. 2 ♀♀ 26 mm. with houses, and one 20 mm. loose.
29. St. WS 95. Between Falklands and South America. 1 ♀ 23 mm. in house.
30. St. WS 105. Between Falklands and South America. 1 ♀ 22 mm. in house with juv. in 3rd instar.

REMARKS. The adults of both sexes appear to be found mostly in the deeper layers, but the young rise to the surface (Stephensen, 1924, p. 119). Propagation takes place in winter and early spring (November to April) or in the more northerly parts of the area of distribution in summer and autumn (Stephensen, 1924, p. 119). The young up to and including the 4th instar remain within the house (Mogk, 1927, p. 130).

These observations are borne out by the present collection. Females with ova were found in October (33°–34° S) and November (3° S), with young in the 1st instar in November (33°–34° S). Young in the 2nd instar were found in June (40° S), in the 3rd and 4th instars in both June (35°–46° S) and October (13° N), in the 5th instar in June (32° S) (latitudes approximate).

Dudich (1926, p. 130) does not admit Stephensen's views, and states that in the Mediterranean there are two "swarms". The autumn swarm rises to the surface and propagates in November to December. The young sink in January and grow in the deeper layers until October, when they rise again. The spring swarm rises in February, propagates in March to April; the young sink and remain below until February. Thus at the surface from October to May there are two maxima or swarms, while in the deeper layers from May to October there are all stages of both swarms, those of the autumn swarm being more advanced. The times of appearance and bathymetrical distribution are similar to those of *Pyrosoma* (p. 133).

The 1st instar is passed within the brood pouch of the mother (cf. no. 18); the 2nd to 4th instars are attached to the wall of the house. Stephensen (1924, p. 119) says that the young are attached in two groups and refers to a figure in Minkiewicz (1909, fig. 22 on p. 2). Minkiewicz does not specifically state the position of the larvae, and his figure may be misleading as it may represent a schematic sagittal section of the animal in its house, after removal of one side of the house on which there may have been a further batch of larvae connecting the two batches drawn in the figure. Stephensen's observations, if they are his own first-hand observations, are in conflict with what I find to be the case in the Discovery material. Here there are twelve houses containing young, and in every case there is only one group. The young are arranged in a radiating manner, their heads pointing in a centrifugal direction. Dudich (pp. 123, 124) says that the larvae feed on the substance of the house, and as they seek for new pastures the "Brutgürtel" spreads and resolves itself into two girdles.

In two cases, no. 3 (October) and no. 22 (June), the group of larvae is composed of individuals in two stages of growth, namely the 3rd and 4th instars. Where the group is composed of individuals all of the same instar, it forms a compact more or less circular patch; but where two instars are present the number of individuals is much greater and they spread out over the whole inside of the house, though they are just as closely packed as in the groups containing only one instar.

The question arises where two instars are present, whether they all belong to one brood or to two broods. Appearances certainly seem to suggest two broods, but one may doubt the possibility of a single female producing two broods in such rapid succession. Further observations on more abundant material might lead to a definite conclusion. Dudich (p. 124) states that the eggs are laid in three batches at three-day intervals.

DISTRIBUTION. Mediterranean; North and South Atlantic, 60° N–36° S; Indo-Pacific.

Phronima atlantica, Guér.

Vosseler, 1901, p. 21, pl. ii, figs. 1–10.
Stephensen, 1924, p. 121, chart 16.
Mogk, 1927, p. 131, chart 2.
Barnard, 1930, p. 422.

Occurrence: 1. St. 39° 05′ N, 13° 04′ W. 1 ♂ 8 mm., 1 ♀ 10 mm.
2. St. 2° 20′ S, 12° 45′ W. 1 ♂ 7 mm., 1 ♀ 8 mm.
3. St. 87. South-east Atlantic. 5 ♂♂ 5–10 mm., 8 ♀♀ and juv. 4–10 mm.
4. St. 89. South-east Atlantic. 9 ♂♂ 6–10 mm., 9 ♀♀ and juv. 4–14 mm.

REMARKS. Propagation appears to take place during both summer and winter, but chiefly in summer (Vosseler, p. 26; Stephensen, p. 124). Mogk (p. 131) records ♂♂ in the penultimate stage in August to October. Vosseler (p. 26) refers to the possibility of there being two broods a year, which is interesting in comparison with the remarks made under *sedentaria*.

None of the present ♂♂ are fully adult, even the largest from St. 87 and 89, which are even larger than the normal size recorded, although only in the penultimate stage.

DISTRIBUTION. Mediterranean; North and South Atlantic, 41° N–40° S; Indian Ocean, 28°–39° S; Pacific Ocean, 37° N–30° S and Chilean coast; Antarctic, 65° S, 88° E.

Phronima curvipes, Voss.

Vosseler, 1901, p. 27, pl. iii, figs. 1–3.
Stephensen, 1924, p. 126, fig. 52, chart 17.
Mogk, 1927, p. 137, chart 6.

Occurrence: 1. St. 3° 50′ S, 12° 54′ W. 1 ovig. ♀ 13 mm.
2. St. 81. South Atlantic. 1 ♀ 13 mm.
3. St. 285. East mid-Atlantic. 1 ♀ 14 mm.
4. St. 288. East mid-Atlantic. 1 ovig. ♀ 12 mm.
5. St. 296. East mid-Atlantic. 1 ♀ 11 mm.

REMARKS. The ♂ of this species is known only from the Gauss expedition, and Mogk expresses a certain hesitation in the identification. Ovigerous ♀♀ are known varying from 11 mm. (Stephensen), 14–16 mm. (Mogk), to 17 mm. (Vosseler); they have been found in June to September (Stephensen) and September (Mogk).

DISTRIBUTION. Mediterranean; North and South Atlantic, 35° N–34° S; Indian Ocean (one record only from 5° S).

Phronima pacifica, Streets.

Vosseler, 1901, p. 29; pl. iii, figs. 4–7.
Stephensen, 1924, p. 130.
Mogk, 1927, p. 140, chart 8.
Barnard, 1930, p. 423.

Occurrence: 1. St. 87. South-east Atlantic. 1 ♀ 9 mm.
2. St. 266. South-east Atlantic. 1 ♀ 7·5 mm.
3. St. 287. East mid-Atlantic. 1 ♀ 7·5 mm., 1 ovig. ♀ 9 mm.

REMARKS. The separation of *colletti*, Bov., from this species will probably prove impossible when more material has been examined on the lines pursued by Mogk (1926). Mogk (1927, p. 125) refers to certain transitional specimens, and the present specimens have the dentition on the lower margin of the hand of peraeopod 3 more like that of *colletti*, though the proportions of the 4th and 5th joints and of the whole limb are those of *pacifica*.

DISTRIBUTION. Mediterranean; North and South Atlantic, 53° N–9° S; Indo-Pacific.

Phronima colletti, Bov.

Vosseler, 1901, p. 32; pl. iii, figs. 8–10; pl. iv, figs. 1–3.
Stephensen, 1924, p. 127, chart 18.
Mogk, 1927, p. 139, chart 7.

Occurrence: St. 290. East mid-Atlantic. 1 ♂ 7 mm.

DISTRIBUTION. Mediterranean; North and South Atlantic, 41° N–35° S; Indo-Pacific.

Genus **Phronimella**, Claus.

Stephensen, 1924, p. 130.

Phronimella elongata (Claus).

Vosseler, 1901, p. 40, text-fig.
Stephensen, 1924, p. 130, chart 19.
Mogk, 1927, p. 141, charts 9–11.
Barnard, 1930, p. 423.

Occurrence: 1. St. 2° 20′ S, 12° 45′ W. 1 ♂ 6 mm. in penult. instar, 2 adult ♂♂ 7 mm., 10 ♀♀ 5–11 mm.
2. St. 296. East mid-Atlantic. 1 adult ♂ 7 mm., 4 ♀♀ 9–10 mm.

REMARKS. Mogk has mentioned the changes in the antennae of the ♂ at different stages of growth, but has not mentioned a difference in the pleopods. The peduncles of the adult ♂ have the very broad ovoid, almost subcircular, shape, which is characteristic of the adult ♂ in the genus *Phronima*. In the penultimate stage, as represented by the 6 mm. specimen recorded above, the peduncles are elongate oval, twice as long as wide; in cross-section they are thin, whereas in the adult they are thick and heart-shaped (Vosseler, p. 42).

The breeding period appears to be August to November in the Mediterranean (Lo Bianco, quoted in Stephensen, p. 133). Stephensen records adult ♂♂ in January to April, June to August, and October and November; Mogk records adult ♂♂ in August to October and a preponderance of large-sized (not the largest) ♀♀ in September.

DISTRIBUTION. Mediterranean; North and South Atlantic, 43° N–37° S; Indo-Pacific; Antarctic, 63° S, 82° E.

Family PHROSINIDAE

Stebbing, 1888, p. 1423.
Bovallius, 1889, p. 396 (*Anchylomeridae*) (key to genera).
Spandl, 1927, p. 167 (*Anchylomeridae*) (key to genera).

Genus Phrosina, Risso.

Stebbing, 1888, p. 1424.
Bovallius, 1889, p. 421.

Phrosina semilunata, Risso.

Bovallius, 1889, p. 426, pl. xviii, figs. 3–30.
Stewart, 1913, p. 257.
Stephensen, 1924, p. 138, chart 21.
Chevreux and Fage, 1925, p. 413, fig. 409.
Spandl, 1927, p. 168 and p. 282, figs. 60, 61.
Barnard, 1930, p. 424.

Occurrence: 1. St. 2° 20′ S, 12° 45′ W. 1 ♂ 4 mm.
2. St. 89. South-east Atlantic. 1 ♂ 5 mm., 4 ♀♀ 6–9 mm.
3. St. 101. South-east Atlantic (350–400–0 m.). 1 ovig. ♀ 23 mm., 1 ♀ 13 mm., 1 juv. 10 mm.
4. St. 254. South-east Atlantic. 1 ♀ with embryos 25 mm.
5. St. 266. South-east Atlantic. 1 ♂ 7·5 mm.
6. St. 267. South-east Atlantic (117–0 m.). 1 ovig. ♀ 19 mm.
7. St. 273. Portuguese West Africa. 2 ♀♀ 22 mm.
8. St. 283. East mid-Atlantic. 1 ovig. ♀ 23 mm.
9. St. 284. East mid-Atlantic. 1 ovig. ♀ 19 mm.
10. St. 285. East mid-Atlantic. 2 ♀♀ 12 and 22 mm.
11. St. 286. East mid-Atlantic. 2 ♀♀ 14 and 19 mm.
12. St. 287. East mid-Atlantic. 1 ♀ 15 mm., 1 ovig. ♀ 24 mm.
13. St. 297. East mid-Atlantic. 1 ♀ 21 mm.

REMARKS. At St. 101 other hauls, both day and night, between 850 and 2580 m were made but specimens were only taken at the depth of 350–400–0 m.

DISTRIBUTION. Mediterranean; North and South Atlantic, 47° N–35° S; Indo-Pacific; Antarctic, 64°–65° S, 80°–85° E.

Genus Primno, Guér.

Stebbing, 1904, p. 38.

Primno macropa, Guér. (Pl. I, fig. 8).

Vosseler, 1901, p. 87, pl. viii, fig. 21 (1st antenna of adult ♂) (*Euprimno macropus*).
Stebbing, 1904, p. 38, figs. 1, 2 (uropod of juv.).
Stewart, 1913, p. 258.
Stephensen, 1924, p. 143, chart 22 (*Euprimno macropus*).
Chevreux and Fage, 1925, p. 416, fig. 411 (*Euprimno macropus*).
Monod, 1926, p. 50, fig. 49.
Spandl, 1927, p. 168.
Barnard, 1930, p. 424.

Occurrence: 1. St. MS 32. South Georgia. 2 juv. 3·5–4 mm.
2. St. 9. South Atlantic (0 m.). 1 ♀ 11 mm.
3. St. 33. South Georgia. 4 ♀♀ (1 with embryos) 10–13 mm.
4. St. 35. South Georgia. 2 ♀♀ 11 and 13 mm., 1 juv. 7 mm.
5. St. 38. South Georgia. 1 ♀ 11 mm.
6. St. 71. South-west Atlantic. 3 ♀♀ 14–15 mm., 2 juv. 7–8 mm.
7. St. 78. South Atlantic. 3 ♂♂ 6·5–7 mm., 1 ♀ 10 mm.
8. St. 89. South-east Atlantic. 2 juv. ♂♂ 4–4·5 mm., 7 ♀♀ 4·5–10 mm., 2 ovig. ♀♀ 7–8·5 mm.
9. St. 105. South-east Atlantic. 4 ♀♀ 11–14 mm., 2 ovig. ♀♀ 11–12 mm.
10. St. 120. South Atlantic. 1 ♂ 7 mm.
11. St. 151. South Georgia. 2 ♀♀ 8–9 mm.
12. St. 239. South-west Atlantic. 2 ovig. ♀♀ 14 mm.
13. St. 257. South-east Atlantic. 1 ♂ 8 mm.
14. St. 266. South-east Atlantic. 5 ovig. ♀♀ 7–9 mm.
15. St. 297. East mid-Atlantic. 1 ovig. ♀ 6 mm.

REMARKS. In no. 7 the smallest ♂ is in the penultimate stage, the largest is adult. The process of antenna 1 is considerably longer than in the figures given by Vosseler, and by Chevreux and Fage.

At St. 89 and St. 151 other (day) hauls were made in 1275–0 m., including horizontal hauls 0–132 m., and vertical hauls at several levels down to 1000 m., but with negative results as far as this species was concerned.

Note 70 for St. 105 states that the blue colouring is due to eggs which are cobalt-blue. The distal joints of peraeopod 3 were missing in the specimen figured. This coloured sketch is reproduced here on Pl. I, fig. 8.

This appears to be principally a rather deep-water species (500–1000 m. or more) and propagates throughout the year (Stephensen, 1924, p. 145). Ovigerous ♀♀ were found in June and July (29°–46° S), August (12° N) and November (44° S) by the 'Discovery'. The present material also appears to afford some evidence that the larger specimens come from the higher latitudes (cf. nos. 3, 8, 9, 12, 14 and 15).

DISTRIBUTION. Mediterranean; Atlantic, 47° N–36° S; Indo-Pacific; Antarctic, 58°–66° S, 85°–89° E.

Genus **Anchylomera**, M. Edw.

Stebbing, 1888, p. 1432.
Bovallius, 1889, p. 408.

Anchylomera blossevillei, M. Edw.

Barnard, 1930, p. 425 (references).

Occurrence: 1. St. 101. South-east Atlantic (350–400–0 m.). 1 ♀ 9 mm.
2. St. 257. South-east Atlantic. 2 ♂♂ 9 mm.

REMARKS. The ♂♂ show no traces of the metallic sheen. It is curious that there should be so few specimens in the present collection.

DISTRIBUTION. Mediterranean; Atlantic, 43° N–38° S; Indo-Pacific.

Family PRONOIDAE

Stephensen, 1925 *a*, p. 155.
Spandl, 1927, p. 216 (key to genera[1]).

Genus **Pronoë**, Guér.

Stebbing, 1888, p. 1507.

Pronoë capito, Guér.

Claus, 1887, p. 50, pl. xii, figs. 1–14.
Stebbing, 1888, p. 1508, pl. clxxxvi.
Spandl, 1924, p. 34, fig.; 1927, p. 217.
Pirlot, 1929, p. 147.

Occurrence: 1. St. 276. East mid-Atlantic. 4 ♀♀ 7–10 mm.
2. St. 288. East mid-Atlantic. 2 ♀♀ 12 mm.
3. St. 294. East mid-Atlantic. 1 ♀ 10 mm.
4. St. 295. East mid-Atlantic. 1 ♂ 9 mm.
5. St. 296. East mid-Atlantic. 2 ♀♀ 9–10 mm. (the larger with uterine ova).

DISTRIBUTION. Mediterranean; North Atlantic, 0°–32° N; Red Sea and Indian Ocean; South Pacific.

Genus **Eupronoë**, Claus.

Stephensen, 1925 *a*, p. 156.
Spandl, 1927, p. 222.

Eupronoë minuta, Claus. (Pl. I, fig. 6).

Stebbing, 1888, p. 1513 (*pacifica* juv. ♂) and p. 1516.
Chevreux and Fage, 1925, p. 425, fig. 417.
Stephensen, 1925 *a*, p. 160, figs. 55, 56.
Spandl, 1927, p. 223, fig. 41.

Occurrence: 1. St. 89. South-east Atlantic. 2 ♀♀ 6 mm.
2. St. 266. South-east Atlantic. 6 ♂♂ and 2 ♀♀ 6 mm. (1 ♀ with embryos).

REMARKS. Although recorded from the South Pacific (south of Australia) this species does not seem to have been caught hitherto in the South Atlantic.

DISTRIBUTION. Mediterranean; North Atlantic about 36°–31° N.; Canaries and Azores; South Pacific.

Eupronoë maculata, Claus.

Stebbing, 1888, p. 1510, pl. clxxxvii (*inscripta*).
Stephensen, 1925 *a*, p. 156, figs. 53, 54, chart 24.
Spandl, 1927, p. 222.
Barnard, 1930, p. 426.

Occurrence: St. 297. East mid-Atlantic. 1 ♂ 8 mm.

DISTRIBUTION. Mediterranean; Atlantic, 40° N–29° S; Indo-Pacific.

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[1] *Paralycaea* omitted. Under $2b_2$ "das Telson..." refers to *Sympronoë*, not to *Parapronoë*; and under $1b_1$ and $1b_2$ the word "ersten" seems to have been omitted before "Pereiopodenpaare".

Genus Parapronoë, Claus.

Claus, 1887, p. 53.
Stephensen, 1925 *a*, p. 165.
Spandl, 1927, p. 219.
Barnard, 1930, p. 427.

Parapronoë clausoides, Stebb. (Fig. 165).

Stebbing, 1888, p. 1529, pl. cxci.
Walker, 1909, p. 54.
Stephensen, 1925 *a*, p. 165 (united with *crustulum*).

Occurrence: St. 296. East mid-Atlantic. 3 ♀♀ with embryos 17 mm.

REMARKS. Identified with *clausoides* on account of the very conspicuous serration of the 2nd joint of peraeopod 4, as shown in Stebbing's figure; but this serration is stronger and all the denticles except those on the proximal third of the row point towards the base of the joint; also on account of the elongate process of the 4th joint of same peraeopod, and the two terminal joints of peraeopod 5. The sides of the telson, however, are evenly convex as in *clausi* and *crustulum*, and the lower margin of the 5th joint of gnathopod 1 is smooth. All these characters may later be shown to be subject to variation.

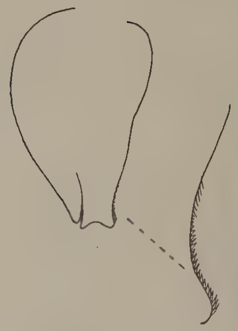
Fig. 165. *Parapronoë clausoides*, Stebb. Second joint of peraeopod 4, with margin further enlarged.

DISTRIBUTION. Australia; Indian Ocean.

Parapronoë crustulum, Claus.

Claus, 1887, p. 55, pl. xv.
Stebbing, 1888, p. 1530, pl. cxciii, fig. *A*.
Stephensen, 1925 *a*, p. 165.
Spandl, 1927, p. 220, fig. 39 (*stebbingi*) and p. 221, fig. 40.

Occurrence: 1. St. 276. East mid-Atlantic. 3 ♀♀ 10–12 mm.
2. St. 285. East mid-Atlantic. 1 ♀ 13 mm., 3 ♀♀ with embryos 17–18 mm.
3. St. 286. East mid-Atlantic. 1 ♀ 13 mm.
4. St. 287. East mid-Atlantic. 2 ♀♀ (1 ovig.) 13 mm., 1 ♀ 18 mm.
5. St. 290. East mid-Atlantic. 2 ♀♀ with embryos 16 and 18 mm.

DISTRIBUTION. Atlantic, 47°–17° N; Indo-Pacific.

Parapronoë campbelli, Stebb.

Stebbing, 1888, p. 1522, pl. clxxxix.
Chevreux, 1900, p. 152.
Barnard, 1930, p. 427.

Occurrence: St. 87. South-east Atlantic. 1 ♀ 10·5 mm.

REMARKS. This forms the first record of this species from the South Atlantic.

DISTRIBUTION. North Atlantic (Azores); Pacific, 35° N and New Zealand Sea.

Genus **Sympronoë**, Stebb.

Stebbing, 1888, p. 1533.

Sympronoë parva (Claus).

Claus, 1887, p. 55, pl. xiv, figs. 13–18.
Stebbing, 1888, p. 1533, pl. cxcii and p. 1537, pl. cxciii, fig. *B* (*propinqua*).
Shoemaker, 1925, p. 42, figs. 14, 15 (*anomala*).
Stephensen, 1925 *a*, p. 162, fig. 58; and var. 7-*articulata*, p. 162, figs. 59, 60.
Spandl, 1927, p. 225, fig. 43.

Occurrence: St. 286. East mid-Atlantic. 1 ♂ 6 mm., 1 ♀ 6·5 mm.

Remarks. There seems to me no reason for regarding *propinqua* and *anomala* as separate species. Shoemaker's species has three terminal joints in peraeopod 5; Stephensen's var. 7-*articulata* has the full number of joints. Spandl refers to the variability of *parva*. The present ♂ has the triangular telson of *propinqua* and two terminal joints in peraeopod 5.

Distribution. Mediterranean; Atlantic, 10° N–10° S; Indo-Pacific.

Family LYCAEIDAE

Chevreux and Fage, 1925, p. 426 (part).
Stephensen, 1925 *a*, p. 167.
Spandl, 1927, p. 211 (part).

Genus **Lycaea**, Dana.

Chevreux and Fage, 1925, p. 429.
Barnard, 1930, p. 428.

Lycaea nasuta, Claus.

Claus, 1887, p. 62, pl. xviii, figs. 1–7.
Barnard, 1930, p. 430, fig. 59.

Occurrence: 1. St. 89. South-east Atlantic. 1 ♂ 8 mm.
2. St. 286. East mid-Atlantic. 1 ovig. ♀ 8 mm.

Remarks. This species has not hitherto been reported from the Atlantic.

The ♀ is more like a *Thamneus* in shape, having the head and peraeon twice as broad as in the ♂. The projection of the lower distal corner of the 6th joint in gnathopods 1 and 2 is very small, i.e. the distal width is scarcely twice the basal width of the dactylus, which is very short. Dactyls of peraeopods 1–4 very short.

Distribution. Zanzibar; New Zealand.

Family BRACHYSCELIDAE

Stephensen, 1925 *a*, p. 171.

Genus Brachyscelus, Bate.

Stephensen, 1925 *a*, p. 172.

Brachyscelus crusculum, Bate.

Stewart, 1913, p. 262.
Chevreux and Fage, 1925, p. 427, fig. 418.
Stephensen, 1925 *a*, p. 172, chart 26.
Spandl, 1927, p. 210.

Occurrence: 1. St. 83. South-east Atlantic. 1 ovig. ♀ 17 mm.
2. St. 89. South-east Atlantic. 3 ovig. ♀♀ 15–16 mm.
3. St. 101. South-east Atlantic (350–400–0 m.). 1 ♀ 17 mm.
4. St. 257. South-east Atlantic. 1 ♂ 14 mm.
5. St. 267. South-east Atlantic (450–550–0 m.). 1 ♂ 17 mm.
6. St. 273. Portuguese West Africa. 4 ♂♂ 13–14 mm., 5 ♀♀ 14–16 mm. (ovig. and with embryos).
7. St. 276. East mid-Atlantic. 2 ♂♂ 13 mm., 4 ♀♀ 9–14 mm., 1 ovig. ♀ 16 mm.
8. St. 286. East mid-Atlantic. 1 ♂ 15 mm.
9. St. 296. East mid-Atlantic. 1 ♂ 15 mm., 1 ♀ 14 mm., 1 ♀ 20 mm.

DISTRIBUTION. Mediterranean; Atlantic, 51° N–32° S; North Pacific.

Brachyscelus rapax, Claus (Pl. I, fig. 7).

Claus, 1887, p. 59, pl. xvii, figs. 1–8.

Occurrence: St. 25° 47′ S, 14° 48′ W. 3 ♀♀ 6·5 mm.

DESCRIPTION. Telson apically rounded.

Gnathopods 1 and 2, 5th joint without projection overhanging base of 6th joint, distal margin with one tooth, lower margin with three teeth, not including the apical tooth, lower margin in gnathopod 1 in addition finely serrulate, 6th joint with three teeth on inner margin.

Peraeopods 1–3, margins of all joints smooth. Peraeopod 4, anterior margin of 4th joint smooth, of 5th and 6th pectinate. Peraeopod 5, 2nd joint pyriform, subequal to the following joints together.

Uropod 1, rami longer than peduncle, inner ramus lanceolate, broader than outer ramus. Uropod 2, outer ramus about as long as peduncle, inner ramus considerably longer, ovate lanceolate. Uropod 3, inner ramus considerably longer than outer, ovate lanceolate.

REMARKS. Note 12 accompanying a coloured sketch from life says: "The brilliant iridescent colouring, produced by the physical properties of the surface, is backed by deeply pigmented chromatophores".

DISTRIBUTION. Cape of Good Hope (Claus).

Brachyscelus globiceps (Claus).

Claus, 1887, p. 59, pl. xvi, figs. 1, 2, 4–10.
Stephensen, 1925 *a*, p. 176, fig. 65.
? Stebbing, 1888, p. 1555, pl. cxcvii, fig. *C* (*latipes*).

Occurrence: St. 273. Portuguese West Africa. 1 ♀ 13 mm. (breadth of head 4·5 mm., of peraeon 5 mm.).

Remarks. As regards the telson and uropods this specimen agrees better with Stebbing's figure than with Stephensen's, the telson being apically rounded, and the outer ramus of uropod 3 four-fifths the length of the inner ramus.

The conspicuous scale markings mentioned by Stebbing are not visible, but the integument of the peraeon and pleon is minutely scabrous.

I am not quite satisfied that this specimen is correctly identified with Claus' species. Neither Stebbing nor Stephensen make any special mention of the breadth of the head and peraeon, which is particularly noticeable in comparison with *crusculum*. In fact at a first glance it appears to be a *Thamneus*, but the 4th–6th joints of peraeopod 4 are regularly pectinate on their margins, and are without the additional setae found in *T. platyrhynchus*.

Distribution. Mediterranean; Zanzibar; South Pacific (*latipes*).

Genus Thamneus, Bov.

Stebbing, 1888, p. 1558.
Stephensen, 1925 *a*, p. 180 (*Euthamneus*).
Pirlot, 1929, pp. 152, 153 (*Euthamneus*).

I cannot follow Pirlot in separating *Thamneus* and *Brachyscelus* into different families. They appear to me to be intimately related, and Stebbing (1888, p. 1555) considered *B. bovallii* as in some respects a connecting link between the two genera. With a series of forms like *bovallii*, *globiceps*, *rapacoides*, the difficulty is to find a distinctive character separating the two genera. At first sight it appears that the very regular pectination of the margins of the 4th-6th joints of peraeopod 4 is absent in *Thamneus* (it is not shown in Stephensen's fig. 70, and only indistinctly in Stebbing's figure, pl. cxcviii), but it is present in the specimen here examined, though nearly obsolete on the 4th joint.

The articulation of the telson with the last pleon segment is not a distinguishing feature, as the telson is just as movably articulated in *Brachyscelus* as in *Thamneus*.

Under the International Nomenclatorial Rules the original name must stand.

Thamneus platyrhynchus, Stebb.

Stebbing, 1888, p. 1558, pl. cxcviii.
Stephensen, 1925 *a*, p. 180, figs. 69, 70 (*Euthamneus p.*).
Spandl, 1927, p. 210 (*Euthamneus p.*).

Occurrence: St. 281. East mid-Atlantic. 1 ♀ 7·5 mm.

Remarks. Though the types of *rostratus* are no longer extant, Stephensen thinks that in all probability this species is the same as Bovallius' species.

Distribution. Mediterranean; Atlantic, about 51° N–5° S; Indo-Pacific; Cape of Good Hope (*rostratus*).

Family OXYCEPHALIDAE

Bovallius, 1890.
Stephensen, 1925 *a*, p. 182.
Spandl, 1927, p. 178.

Stephensen makes *Dorycephalus* synonymous with *Leptocotis*; he retains *Rhabdosoma* (*Xiphocephalus*) within the family, and also *Simorhynchotus*, though the latter, together with *Metalycaea* and *Glossocephalus*, form a transition to the Lycaeidae as regards the shape of the head. Spandl, without giving critical reasons, excludes *Simorhynchotus* from this family and assigns it to the Lycaeidae.

Genus **Oxycephalus**, M. Edw.

Bovallius, 1890, p. 54 (key to species).
Spandl, 1927, p. 179.
Cecchini, 1929, p. 5 (two n.spp.).

Oxycephalus clausi, Bov.

Bovallius, 1890, p. 60, figs. 4, 7, 8, 22, 54, 65; pl. i, figs. 19–24; pl. ii, fig. 1.
Stephensen, 1925 *a*, p. 188, chart 27.
Spandl, 1927, p. 180.
Barnard, 1930, p. 433.

Occurrence: 1. St. 33° 37′ N, 14° 39′ W. 1 ♂ about 21 mm. (telson and uropods missing).
2. St. 34° 23′ N, 14° 32′ W. 2 juv. 12 mm.
3. St. 101. South-east Atlantic (350–400–0 m.). 1 ♀ 36 mm.
4. St. 268. Portuguese West Africa (73–0 m.). 1 ♂ 17 mm., 1 ♀ with embryos 34 mm.
5. *ditto* (100–150–0 m.). 1 ♀ 30 mm.
6. St. 284. East mid-Atlantic. 1 ♂ 23 mm., 1 ♀ (spent) 29 mm.
7. St. 285. East mid-Atlantic. 3 ♀♀ 15, 23, 24 mm., 2 ovig. ♀♀ 22 and 29 mm.
8. St. 286. East mid-Atlantic. 1 ♀ 21 mm.
9. St. 287. East mid-Atlantic (124–0 m.). 1 ♀ 20 mm., 1 ovig. ♀ 28 mm., 1 ♀ (spent) 30 mm.
10. *ditto* (800–1000–0 m.). 4 ♂♂ 12–16 mm., 4 ♀♀ 16–24 mm.
11. St. 288. East mid-Atlantic. 1 ovig. ♀ 28 mm.
12. St. 290. East mid-Atlantic. 1 ♀ 20 mm. (mutilated), 1 ovig. ♀ 25 mm.
13. St. 294. East mid-Atlantic. 1 ♀ 19 mm.
14. St. 296. East mid-Atlantic. 2 ♀♀ 15–16 mm.

DISTRIBUTION. Mediterranean; Atlantic, 43° N–29° S; Indo-Pacific.

Oxycephalus piscator, M. Edw.

Bovallius, 1890, p. 56, figs. 33, 35, 36, 37, 41, 42, 66, 68, 69, 75 and pl. i, figs. 8–16.
Stephensen, 1925 *a*, p. 186, chart 27.
Spandl, 1927, p. 180, figs. 13 *a–d*.
Barnard, 1930, p. 433.

Occurrence: 1. St. 270. East mid-Atlantic (200–0 m.). 1 ♂ 19 mm.
2. St. 281. East mid-Atlantic. 1 ♀ 19 mm.

REMARKS. Stephensen does not refer to the specific differences between *piscator* and *clausi* or to any variability in the two gnathopods. Spandl figures gnathopods 1 and 2 for this species with a projecting keel on the anterior margin of the 5th joint, which is in conflict with Bovallius' statements. The present specimens agree with Bovallius' figures.

DISTRIBUTION. Mediterranean; Atlantic, 41° N–29° S; Indo-Pacific.

Genus Streetsia, Stebb.

Bovallius, 1890, p. 80 (key to species).
Senna, 1902, p. 19 (key to species).
Colosi, 1918, p. 218.
Stephensen, 1925 *a*, p. 192.
Spandl, 1927, p. 184 (key to species).

Streetsia challengeri, Stebb.

Stephensen, 1925 *a*, p. 194, fig. 75, chart 29 (synonymy and growth changes).
Barnard, 1930, p. 435.

Occurrence: 1. St. 86. South-east Atlantic. 1 ♂ 29 mm.
2. St. 87. South-east Atlantic. 1 juv. 9 mm.
3. St. 250. South Atlantic. 1 ♂ 25 mm.
4. St. 254. South-east Atlantic. 1 ♂ 32 mm.
5. St. 266. South-east Atlantic. 1 ♀ with embryos 13 mm.
6. St. 273. Portuguese West Africa. 1 ♀ 30 mm.
7. St. 281. East mid-Atlantic. 1 ♀ with embryos 38 mm.
8. St. 285. East mid-Atlantic. 1 ♀ with embryos 44 mm.
9. St. 288. East mid-Atlantic. 1 ♂ 27 mm., 2 ♀♀ 16 and 22 mm.
10. St. 295. East mid-Atlantic. 1 ♂ 31 mm.
11. St. 296. East mid-Atlantic. 1 ovig. ♀ 40 mm.

REMARKS. Stephensen has traced the growth changes in a series of 230 specimens from the Thor expedition. It appears to live at depths of 500–3000 m., but rises towards the surface layers at night. Nos. 3–6, 8, 9 and 11 of the present captures are from night hauls in 500–0 m., the others from day hauls in much greater depths. The very small size of the ♀ with embryos, no. 5, compared with the sizes given by Stephensen, viz. 21–27 mm., and with that of the present nos. 7, 8 and 11, is remarkable. It corresponds with the 12 mm. stage of the ♀ described by Stephensen, and lacks the "femoral process" on gnathopod 2, the 5th joint of which has no spinous teeth on the front or lower margin (except the apical tooth). The large ♀♀ of nos. 8 and 11 constitute records as far as size is concerned.

DISTRIBUTION. Mediterranean; Atlantic, 41° N–19° S; Indo-Pacific.

Streetsia porcellus (Claus).

Stebbing, 1888, p. 1587, pl. cciii.
Stephensen, 1925 *a*, p. 192, chart 28.
Spandl, 1927, p. 188, figs. 20, 21 (*intermedia*).
Barnard, 1930, p. 435.

Occurrence: St. 290. East mid-Atlantic. 1 ovig. ♀ 15 mm.

REMARKS. The present ♀ has no notch on the hinder part of the head, as in the ♂♂ figured by Stebbing and Spandl.

DISTRIBUTION. Mediterranean; Atlantic, 37° N–0°; Indo-Pacific.

Streetsia steenstrupi, Bov.

Bovallius, 1890, p. 89, figs. 20, 38, 52, 55, and pl. iii, figs. 2–6.

Occurrence: St. 286. East mid-Atlantic. 1 ♂ 10 mm.

REMARKS. Agrees with Bovallius' description and figures. This species has not apparently been reported since the publication of Bovallius' work.

DISTRIBUTION. Tropical Atlantic.

Genus **Leptocotis**, Streets.

Stephensen, 1925 *a*, p. 191.
Spandl, 1927, p. 204 and p. 203 (*Dorycephalus*).
Barnard, 1930, p. 434.

Leptocotis tenuirostris (Claus).

Stewart, 1913, p. 264 (*Dorycephalus lindströmi*).
Stephensen, 1925 *a*, p. 191, fig. 74.
Barnard, 1930, p. 435.

Occurrence: St. 296. East mid-Atlantic. 1 ♀ 9·5 mm.

DISTRIBUTION. Atlantic, 43° N–32° S; Indo-Pacific.

Genus **Rhabdosoma**, Ad. and White.

Stebbing, 1895, p. 367.
Stephensen, 1925 *a*, p. 203.
Spandl, 1927, p. 207 (key to four species).
Cecchini, 1929, p. 11.

The measurements of all specimens given below are taken from the anterior margin of the eye to the base of the telson, because the rostral point and the telson are so frequently mutilated.

Rhabdosoma whitei, Bate.

Stephensen, 1925 *a*, p. 207.
Spandl, 1927, p. 208, figs. 31 *a–f* (typo. err. "*withei*").
Cecchini, 1929, p. 11, pl. v.
Barnard, 1930, p. 436.

Occurrence: 1. St. 29° 26′ N, 15° 07′ W. 1 ♂ 35 mm.
2. St. 282. East mid-Atlantic. 1 ♀ with embryos 27 mm.
3. St. 285. East mid-Atlantic. 1 ♂ 32 mm.
4. St. 287. East mid-Atlantic (800–1000–0 m.). 1 ♂ 32 mm.
5. St. 288. East mid-Atlantic (73–0 m.). 1 ♂ 26 mm., 1 ♀ 30 mm., 1 ♀ with embryos 30 mm.
6. *ditto* (250–0 m.). 1 ♂ 29 mm., 3 ♀♀ 18, 30 and 32 mm., 1 ♀ with embryos 28 mm.
7. St. 289. East mid-Atlantic. 3 ♂♂, 1 ovig. ♀, 1 ♀ with embryos 25–30 mm.
8. St. 290. East mid-Atlantic. 6 ♂♂ 29–32 mm., 1 ♀ 32 mm., 2 ♀♀ with embryos 28 and 32 mm.
9. St. 292. East mid-Atlantic. 2 ♂♂ 25 and 30 mm.
10. St. 294. East mid-Atlantic. 1 damaged ♀ about 30 mm.
11. St. 296. East mid-Atlantic. 6 ♀♀ 21–31 mm., 2 ♀♀ with embryos 28 and 32 mm.
12. St. 297. East mid-Atlantic (163–0 m.). 1 ♂ 28 mm., 1 ♀ with embryos 32 mm.
13. *ditto* (200–300–0 m.). 1 ♂ 29 mm.

Remarks. No comment is necessary on the present specimens. Spandl's remarks *re* Bovallius' figures are uncalled for; he has failed to realize that the figures in question are not Bovallius' own figures but facsimiles from Bate and Streets. There are several misprints in Spandl's own paragraph, and he persistently writes *withei* instead of *whitei*.

Distribution. Atlantic, 37° N–21° S; Indo-Pacific.

Rhabdosoma armatum (M. Edw.).

Bovallius, 1890, p. 119, figs. 2, 57, 80 and pl. vi, figs. 1–20.
Spandl, 1927, p. 210.
Barnard, 1930, p. 436.

Occurrence: 1. St. 288. East mid-Atlantic (73–0 m.). 1 ♀ 33 mm.
2. Ditto (250–0 m.). 1 ♀ 36 mm., 1 ♀ with embryos 42 mm.

Distribution. Tropical Atlantic; Indian and Pacific Oceans.

Family PLATYSCELIDAE

Claus, 1887, p. 30.
Stephensen, 1925 *a*, p. 212.
Spandl, 1924, p. 34; 1927, p. 227 (key to genera).

Genus **Platyscelus**, Bate.

Stephensen, 1925 *a*, p. 213.
Spandl, 1927, p. 227 (key to species).

Platyscelus ovoides (Claus).

Chevreux and Fage, 1925, p. 420, fig. 413.
Stephensen, 1925 *a*, p. 213, chart 30.
Spandl, 1927, p. 228, fig. 44.

Occurrence: 1. St. 29° 26′ N, 15° 07′ W. 3 ♀♀ (1 ovig.) 17–18 mm., and other mutilated fragments, from stomach of *Naucrates ductor*.
2. St. 64. South-west Atlantic. 2 juv. 9 and 11 mm.
3. St. 83. South-east Atlantic. 1 ovig. ♀ 20 mm.
4. St. 85. South-east Atlantic. 1 ♀ with embryos 18 mm.
5. St. 89. South-east Atlantic. 2 ♀♀ 12 and 15 mm. (the larger with embryos).
6. St. 268. South-east Atlantic. 21 ♀♀ 12–18 mm. (the larger ones with embryos).
7. St. 285. East mid-Atlantic. Seventeen specimens 9–20 mm., incl. some ♀♀ with embryos 15–20 mm.
8. St. 288. East mid-Atlantic. Many, mostly ♀♀, 10–20 mm.
9. St. 294. East mid-Atlantic. 2 ♀♀ 17 and 20 mm. (the larger one ovig.).
10. St. 298. East mid-Atlantic. 3 ♀♀ 13–15 mm.

Remarks. The southward distribution is extended to lat. 48° S by these captures. There seems to be some evidence of a day-night migration, the three day hauls being in greater depths than the night hauls (except no. 3), though none of the captures were made in closing nets. Breeding takes place in June in the South Atlantic, and in July, August and October in the northern Atlantic.

The colour of no. 3 is given as: "Pale horn colour, thoracic tergites outlined in a deeper shade of the same colour. Gastric and hepatic organs faintly visible as a brownish mass. A red-brown patch near postero-inferior angle of eyes".

DISTRIBUTION. Mediterranean; Atlantic, 51½° N–31° N and 35° S; Indo-Pacific.

Platyscelus armatus (Claus).

Claus, 1887, p. 36, pl. ii, figs. 3–15.
Stewart, 1913, p. 258.
Spandl, 1927, p. 229, fig. 45.

Occurrence: 1. St. 268. South-east Atlantic. 1 ovig. ♀ 14 mm.
2. St. 285. East mid-Atlantic. 2 ♀♀ 13 and 16 mm., the larger with embryos.

DISTRIBUTION. Warm seas (Spandl); 15° 45½′ S, 33° 11½′ W (Stewart).

Platyscelus inermis (Claus).

Claus, 1887, p. 37.
Stewart, 1913, p. 258.
Stephensen, 1925 *a*, p. 252.
Spandl, 1927, p. 232.

Occurrence: 1. St. 276. East mid-Atlantic. 5 ♀♀ 7–10 mm., the largest one ovig.
2. St. 297. East mid-Atlantic. 5 ♀♀ 10–11 mm., some with embryos.

REMARKS. These specimens may belong to this species, which has not been recognized since it was described by Claus. Both Stephensen and Spandl follow Claus in thinking it may be merely an unarmed variety of *armatus*.

The present specimens agree with *armatus* except in lacking the sharp epimeral projections; though these parts are rather more bulging than in *ovoides*. The specimens are smaller than *armatus*, but larger than *serratulus*, with which latter species also they are in close agreement.

Pleon segments 1–3 are dorsally somewhat gibbous, when viewed laterally, thus further agreeing with *armatus*; in *ovoides* and *serratulus* the dorsal profile is quite even.

DISTRIBUTION. Atlantic. Mozambique.

Platyscelus serratulus, Stebb.

Claus, 1887, p. 37, pl. iii, figs. 5–14 (*serratus*, *non* Bate).
Chevreux and Fage, 1925, p. 422, fig. 414.
Shoemaker, 1925, p. 51, figs. 20, 21 (*dubius*).
Barnard, 1930, p. 437.

Occurrence: St. 268. South-east Atlantic. 1 ♂ 6 mm.

DISTRIBUTION. Mediterranean; Atlantic 42° N–37° S; Indo-Pacific.

Genus **Hemityphis**, Claus.

Stephensen, 1925 *a*, p. 219.
Spandl, 1927, p. 233 (key to the two species).

Hemityphis rapax (M. Edw.).

Stebbing, 1888, p. 1472, pl. clxxxiii (*tenuimanus*).
Stewart, 1913, p. 259 (*tenuimanus*).
Stephensen, 1925 *a*, p. 219 (*tenuimanus*).
Spandl, 1927, p. 233, fig. 46 (*tenuimanus*).
Barnard, 1930, p. 437.

Occurrence: 1. St. 66. South-west Atlantic. 1 ♀ 5 mm.
2. St. 87. South-east Atlantic. 4 ♀♀ 5–6 mm.
3. St. 89. South-east Atlantic. 3 ♂♂ 5·5 mm.

DISTRIBUTION. Mediterranean; Atlantic, 41° N–38° S, but not between 15° N and 15° S; Indo-Pacific.

Family THYROPIDAE

Stephensen, 1925 *a*, p. 207 (Parascelidae).
Spandl, 1927, p. 250 (Parascelidae, key to genera).
Barnard, 1930, p. 436.

Genus **Thyropus**, Dana.

Stebbing, 1888, p. 1492.
Spandl, 1927, p. 258.

Thyropus sphaeroma, Claus.

Stebbing, 1888, p. 1492, pl. ccx, fig. *C* (*danae* ♂) and p. 1495.
Spandl, 1927, p. 259, figs. 53, 54 and p. 284, fig. 63.
Barnard, 1930, p. 437.

Occurrence: St. 2° 20′ S, 12° 45′ W. 1 ♂ 7 mm.

DISTRIBUTION. Tropical Atlantic.

Genus **Parascelus**, Claus.

Stephensen, 1925 *a*, p. 208.
Spandl, 1927, p. 262 (key to species).
Barnard, 1930, p. 436.

Parascelus typhoides, Claus.

Claus, 1887, p. 46, pl. ix, figs. 12–16, pl. x, figs. 12, 13.
Chevreux and Fage, 1925, p. 424, fig. 416.
Stephensen, 1925 *a*, p. 211.
Spandl, 1927, p. 262, fig. 55.

Occurrence: St. 81. South Atlantic. 1 ovig. ♀ 5 mm.

REMARKS. This seems to be the first record of this species in the South Atlantic.

DISTRIBUTION. Mediterranean; Atlantic, 42°–17° N; Red Sea.

CYAMIDEA

Stebbing, 1910 *a*, p. 464.

Family CAPRELLIDAE

Mayer, 1882, 1890 and 1903 (the latter with tabular synopsis and key to genera).
Schellenberg, 1926 *a*, p. 465.
Raj, 1927 (*Bull. Madras Govt. Mus.*, n.s. 1), p. 125.

Genus **Caprella**, Lam.

Mayer, 1903, pp. 14, 72.

Caprella equilibra, Say.

Mayer, 1903, p. 89, pl. iii, figs. 29–34; pl. vii, figs. 66–69 (*aequilibra*).

Occurrence: St. 34° 23′ N, 14° 32′ W. 3 ♂♂ 5–8 mm., 1 ♀ with embryos 7 mm., 1 immat. ♀ 6 mm.

DISTRIBUTION. Widely distributed.

Caprella acutifrons, Latr.

Mayer, 1903, p. 79, pl. iii, figs. 4–28; pl. vii, figs. 62–65 (references).
Stebbing, 1910 *a*, p. 465 (*penantis*).

Occurrence: St. 4. Tristan da Cunha. Many, ♂♂ up to 11 mm., ♀♀ up to 6 mm., incl. many ovig., with embryos, and juv.

REMARKS. The ♂♂ have the "poison tooth" of gnathopod 2 proximal and resemble vars. *natalensis* and *porcellio*. The tooth varies in size and may be straight or crooked, so there seems little use in keeping the two varieties separate.

DISTRIBUTION. Widely distributed, including Magellan Strait and the Brazilian coast.

Genus **Pseudaeginella**, Mayer.

Mayer, 1890, p. 37.

Hitherto regarded as a monotypic genus recorded from Tristan da Cunha and Antigua, W.I. For the form from the latter locality, however, a new name is here proposed.

Pseudaeginella tristanensis (Stebb.) (Fig. 166).

Stebbing, 1888, p. 1249, pl. cxliii.
Mayer, 1890, p. 37, pl. v, fig. 51; pl. vi, fig. 14.
Non Stebbing, 1895 (*Ann. Mag. Nat. Hist.* (6), xv), p. 397.
Non Mayer, 1903, p. 59.

Occurrence: St. 4. Tristan da Cunha. 1 ♂ 4·5 mm., 1 ♀ (brood pouch empty) 4·5 mm.

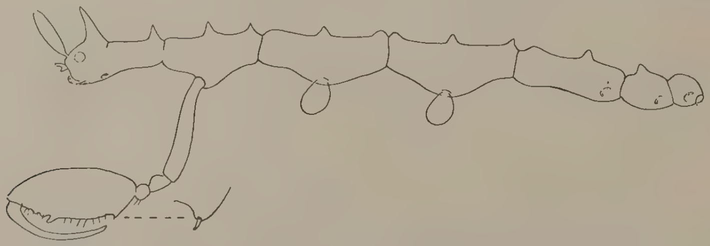

Fig. 166. *Pseudaeginella tristanensis* (Stebb.). General view of ♂.

REMARKS. These two specimens taken in the same locality as Stebbing's original specimen may with good reason be assumed to represent the adult form. Possibly the present ♂ is not fully adult, as it is no bigger than the ♀, and the hand of gnathopod 2 might be expected to show a more pronounced difference from that of the ♀.

Both sexes are alike in the number and arrangement of the dorsal tubercles or spines, which are all single and medio-dorsal.

Antenna 1, flagellum 11-jointed in both sexes. Antenna 2, flagellum 2-jointed. It might even be called 1-jointed, because the junction between the two joints is almost obsolete and difficult to trace. The mandibular palp has three spinules between the two larger ones on the apex of the 3rd joint.

Gnathopod 2 alike in the two sexes, the "poison tooth" small, acute, slightly beyond the centre of the palm, followed by two small rounded denticles. Peraeopods 3–5 lost in both specimens.

In view of these specimens it becomes very unlikely that the specimens (Stebbing says one; Mayer says two) from Antigua are conspecific. The ♀ according to Mayer (1903, p. 59) has the head spine and single medio-dorsal spines on segments 1–3, but also *paired* rounded tubercles in the middle of segments 3 and 4. For this species I therefore propose the name *antiguae*.

Genus **Caprellinoides**, Stebb.

Stebbing, 1888, p. 1237.
Mayer, 1890, p. 87; 1903, p. 57.
Schellenberg, 1926 *a*, p. 467.
Barnard, 1930, p. 440.

The very oblique junction between segments 4 and 5, especially noticeable in the ♂, might be incorporated in the generic diagnosis. It is not well shown in Schellenberg's figure of *antarctica* ♂, but probably exists as in the other species.

Caprellinoides tristanensis, Stebb.

Stebbing, 1888, p. 1238, pl. cxli.
Mayer, 1890, p. 87.

Occurrence: St. MS 14. South Georgia. 1 ♂ 8 mm.

Description of ♂. Head rounded. Eye composed of nine ocelli. A small medio-dorsal conical tubercle near anterior margin on segment 2, and on middle and posterior margin of segments 3 and 4. Peraeon segment 7 and pleon missing.

Antenna 1, flagellum 11-jointed. Antenna 2, flagellum 3-jointed.

Gnathopod 2 as in Stebbing's figure of the ♂. Peraeopod 3 (on segment 5) 3-jointed as in ♂. Peraeopods 4 and 5 lost.

Branchiae on segments 3 and 4, rounded ovate.

Colour reddish, the ocelli darker red.

Remarks. The original type was a ♀ which was re-examined by Mayer. In assigning *C. mayeri* to the same genus as *tristanensis*, Mayer (1890, p. 88) states that some doubt still remains because the ♂ of the latter is unknown. It is therefore very disappointing to find that the present ♂ lacks the very parts which would resolve this doubt.

Distribution. Tristan da Cunha, 110 fathoms.

Caprellinoides mayeri (Pfr.) (Fig. 167).

Pfeffer, 1888, p. 137, pl. iii, fig. 4 (immat.).
Mayer, 1890, p. 88, pl. v, figs. 57, 58; pl. vi, figs. 15, 26; pl. vii, fig. 48.
Chilton, 1913, p. 61.
? Mayer, 1903, p. 59 (*Piperella grata*).

Occurrence: 1. St. 39. South Georgia. 1 ♂ 12 mm.
2. St. 42. South Georgia. 4 ♂♂ 11–14 mm., 6 immat. ♀♀ 8–11 mm., 1 ovig. ♀ 9 mm., 3 juv. 6–7 mm.
3. St. WS 33. South Georgia. 1 ovig. ♀ 10·5 mm., 1 juv. 4 mm.

DESCRIPTION. Eyes recognizable only by the lenses. Medio-dorsal spines in middle (or just behind middle) and on hind margins of segments 2, 3 and 4. No spines on head or on segment 5. A fine sparse pilosity on segments 2–6, chiefly dorsally, often apparently obsolete ventrally. In the juveniles the dorsal spines are represented by mere tubercles, and very young specimens are probably quite smooth.

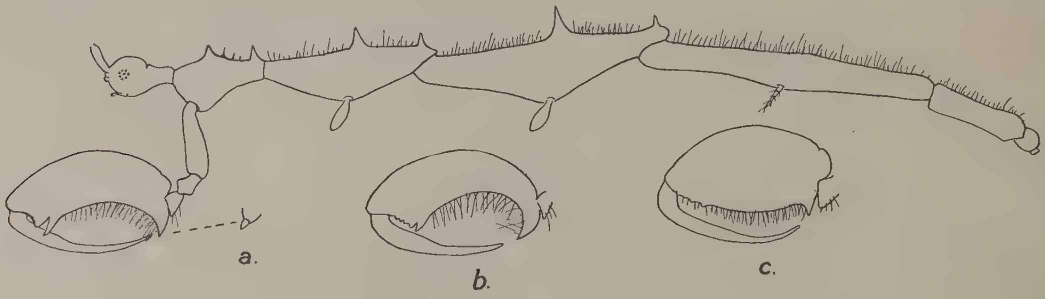

Fig. 167. *Caprellinoides mayeri* (Pfr.). *a*. General view of ♂ (St. 42). *b*. Gnathopod 2 ♂ (St. 39). *c*. Gnathopod 2 ♀ (St. 42).

Antenna 1, flagellum 13–14-jointed in ♂, 11-jointed in ♀. Antenna 2, flagellum 6-jointed in ♂, 5-jointed in ♀. In juveniles the number of joints is less.

Gnathopod 2, 6th joint with palmar margin concave, parallel with dorsal margin, setose, one pointed and one truncate tooth near hinge; in ♀ 6th joint ovate, palm slightly convex, setose, with one or two small teeth near hinge.

REMARKS. I think there can be no doubt that these specimens are the adults of Pfeffer's species described from South Georgia, though none of them are as robust as shown in Pfeffer's figure, and the dorsal spines are better developed.

The 2nd gnathopod in the ♀ has an evenly convex palm, without or with only small teeth near the hinge; that of the young ♂ is like Mayer's figure; that of the adult ♂ has a concave palm.

The ♂ from St. 39 is very slender and has no trace of dorsal spines or tubercles; the hand of gnathopod 2 (Fig. 167 *b*) shows a variant of the form found in the specimen from St. 42. This specimen has the further peculiarity of only six joints in the flagellum of antenna 1, and two joints in that of antenna 2. Thus it seems to have preserved its juvenile characters while developing the adult form of gnathopod 2 earlier than usual.

Colour (as preserved), whitish, with grey or purplish specks, distal half of hand of gnathopod 2 in both sexes also speckled; eyes unpigmented.

With due respect to Mayer, I cannot help suspecting that *Piperella grata*, Mayer, 1903, from South Georgia, and in fact from the same collection whence Pfeffer obtained his species, is only the young of this species.

DISTRIBUTION. South Georgia.

Genus **Dodecas**, Stebb.

Stebbing, 1888, p. 1232; 1910, p. 629.
Mayer, 1890, p. 15; 1903, p. 29.
Briggs, 1914 (*Proc. Roy. Soc. Tasmania*), p. 76.

The genus is austral in distribution, the three hitherto known species being reported from Kerguelen (*elongata*) and South-east Australia (*hexacentrum* and *decacentrum*).

Dodecas reducta, n.sp. (Fig. 169 *b*).

Occurrence: St. 39. South Georgia. 1 ♂ 16 mm.

DESCRIPTION. Forehead rounded. Eyes rather large, circular, distinct. Peraeon segment 2 equal to head plus 1st segment; segments 3, 4, 5 successively increasing a little, segment 6 subequal to segment 3. A forwardly curving horizontal spine over base of gnathopod 2, and a subdorsal pair of similar spines in middle of segment 3.

Antenna 1, flagellum at least 8-jointed, but broken. Antenna 2, flagellum 5-jointed.

Gnathopod 2 inserted in middle of segment, 2nd joint reaching to front of head (= 4th–6th joints together), 5th about one-third length of 2nd, and half length of 6th (but owing to fusion with 6th, its distal end difficult to define), 6th ovate, palm with basal spinigerous tooth, followed by two small spinigerous tubercles, then obscurely serrulate and ending in a low truncate tooth near hinge.

Peraeopod 1 about one-third length of segment 3, very slender, but with full complement of joints. Peraeopod 3, 4th joint as in the other species of the genus. Peraeopods 4 and 5 slender, 2nd and 4th joints slightly bulbous distally, 5th with 3–4 spines on inner margin, 6th stouter than any of the other joints, widest proximally, inner margin with two pairs of spines proximally, one spine near middle and one spine near apex, both 6th and 7th joints stouter than in *elongata*.

Branchiae on segment 2 very small and easily overlooked, scarcely larger than the size of the eye; on segment 3 narrow ovate, about as long as peraeopod 1; on segment 4 slightly smaller.

REMARKS. This species is obviously close to both *elongata* and *hexacentrum*. From the former it differs in possessing spines on the body, the position of insertion of gnathopod 2, the much shorter 5th joint of the 2nd gnathopod, the shorter peraeopod 1, the stouter 6th and 7th joints of peraeopods 4 and 5, and the reduced branchiae on segment 2. From the latter it differs in having only four spines on the body, the shorter 5th joints of gnathopod 2 and the reduced peraeopod 1 and branchiae on segment 2.

Genus Dodecasella, Brnrd.

Barnard, 1931, p. 430.

Mandibular palp 3-jointed, 3rd joint with one long spine at beginning and one at end of a row of short spinules. Flagellum of antenna 2, 6-jointed in ♂, 5-jointed in ♀, without long setae.

Gnathopod 2 inserted anteriorly. Peraeopod 1 (3) about two-thirds to three-quarters length of segment, slender, but with normal number of joints. Peraeopod 2 (4) absent. Peraeopod 3 (5) reduced to four joints. Peraeopods 4 and 5 (6 and 7) long, slender, 6th joint slender, dactyl long, curved.

Branchiae on segments 3 and 4, cylindrical, on segment 3 short, on segment 4 very elongate, especially in ♂.

Pleon as in *Dodecas*, with two pairs of slender, 2-jointed appendages.

Remarks. Very close to *Dodecas*, Stebb., differing only in the absence of branchiae on segment 2 and the very long branchiae on segment 4; and in having the 2nd gnathopod inserted anteriorly, with the 5th joint normal, i.e. short.

Dodecasella elegans, Brnrd. (Figs. 168, 169 *a*).

Barnard, 1931, p. 430.

Occurrence:
1. St. 42. South Georgia. 2 ♂♂ 24 and 38 mm.
2. St. 45. South Georgia. 2 ♂♂ 24 and 33 mm., 1 juv. 14 mm.
3. St. 123. South Georgia. 2 ♂♂ 30 and 42 mm., 1 incomplete ♂, 1 ♀ with 1 ovum in pouch 22 mm. *Types.*
4. St. 140. South Georgia. 13 ♂♂ 16–30 mm., 2 ♀♀ 14 and 16 mm., 1 immat. ♀ 11 mm.
5. St. 144. South Georgia. 22 ♂♂ 14–36 mm., 15 ♀♀ 14–19 mm. (some ovig.).

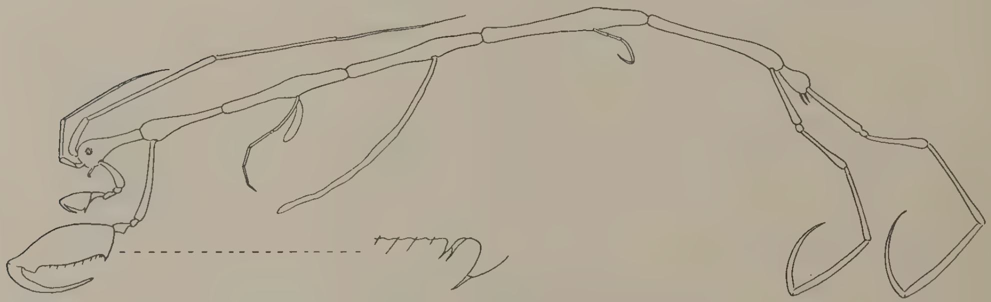

Fig. 168. *Dodecasella elegans*, Brnrd. General view.

Description. Body very elongate and slender, smooth in both sexes, and slightly enlarged at the junctions of segments and insertions of limbs and branchiae. Forehead rounded. Eyes circular but pale and indistinct.

In ♂ segment 2 a little longer than head plus segment 1, segments 3, 4 and 6 each equal to head plus segments 1 and 2; segment 5 a little longer than 4; in ♀ segments 3 and 4 each subequal to segment 2; 5 and 6 subequal to one another and to segments 3 plus 4.

Antenna 1 elongate, reaching back to about middle of segment 4, relatively longer in ♂ than in ♀ owing to greater length of segments 3 and 4 in ♂, flagellum 13-jointed in ♂, in ♀ 5 + ? Antenna 2, flagellum 6 (–7)-jointed in ♂, 5-jointed in ♀, without long setae.

Mouth-parts as figured by Stebbing for *Dodecas elongata* (1888, pl. cxl).

Gnathopod 2 inserted at anterior end of segment, 2nd joint as long as hand (i.e. fused 5th and 6th joints), 6th ovate, palm with basal spinigerous tooth, followed by a pair of small spinigerous tubercles, then obscurely serrulate and setulose, ending in a low truncate tooth near hinge; similar in both sexes but rather smaller in ♀.

Peraeopod 1 a little longer than 2nd joint of gnathopod 2, at least two-thirds length of segment 3. Peraeopod 3 short, 4-jointed, the 4th joint forming a curved claw. Peraeopods 4 and 5 elongate, very slender, 2nd and 4th joints somewhat bulbous distally, 5th slender with two spinules on inner margin, 6th slender, cylindrical, very slightly curved, inner margin with two to three spinules proximally, 7th long, slender and rather strongly curved.

Branchia on segment 3 about two-fifths length of segment; that on segment 4 in ♂ as long as segments 3 and 4 together; in immature ♂ shorter, and in ♀ equal in length to that on segment 3.

Pleon with two pairs of slender, 2-jointed appendages.

Brood lamellae on segment 3 with posterior margin setose, anterior margin of those on segment 4 smooth.

Genus **Aeginoides**, Schell.

Schellenberg, 1926 *a*, p. 465.
Barnard, 1930, p. 441.

Aeginoides gaussi, Schell. (Fig. 169 *d*).

Schellenberg, 1926 *a*, p. 465, fig. 1 (immat.).
Barnard, 1930, p. 442, fig. 63 (adult ♀).

Occurrence: 1. St. 30. South Georgia. 2 ovig. ♀♀ 23, 24 mm.
2. St. 39. South Georgia. 1 immat. ♀ 13 mm.
3. St. 42. South Georgia. 1 ♂ 18 mm., 1 immat. ♀ 15 mm., 1 ovig. ♀ 19 mm.
4. St. 123. South Georgia. 3 ♂♂ 17, 24, 28 mm., 2 ♀♀ 20, 21 mm.
5. St. 152. South Georgia. 1 ovig. ♀ 21 mm.
6. St. 175. South Shetlands. 1 ♂ 23 mm., 1 ovig. ♀ 25 mm.
7. St. 195. South Shetlands. 3 ♂♂ 23, 28, 33 mm., 2 ovig. ♀♀ 26, 28 mm., 10 juv. 6–12 mm.

DESCRIPTION. Forehead rounded. Eyes distinct, round. Peraeon segment 2 subequal to head plus segment 1. Segments 3, 4 and 5 successively longer; segment 6 equal to segment 4.

In young specimens up to 12 mm. the body is smooth. The adult ♂ has a small lateral tubercle over the base of gnathopod 2 and of the branchiae on segments 3 and 4, a medio-dorsal tubercle on segment 2, and a pair of dorso-lateral tubercles vertically above the lateral ones on segments 3 and 4; the medio-dorsal tubercle on segment 2 absent in ♀ and sometimes in ♂; the dorso-lateral tubercles on segments 3 and 4 also are sometimes feeble or obsolete. The dorso-lateral tubercles on the hind margins of segments 2 and 3, present in the Terra Nova ♀, are here only very feebly developed or quite obsolete. Segment 5 is smooth. A short fine pubescence dorsally on segments 3 and 4 in ♀.

Antenna 1, flagellum 17–18-jointed in ♂, 15–16-jointed in ♀. Antenna 2, flagellum 8-jointed in ♂, 5-jointed in ♀.

Gnathopod 2 similar to that of *Dodecasella elegans*.

The rudiment of peraeopod 1 tipped with two setules. Peraeopods 4 and 5 of the type found in *Dodecas reducta*, i.e. with the 6th joint stouter than in *D. elongata*, but cylindrical, with two pairs of spines proximally and one to two single spines in middle of inner margin.

Branchiae on segments 3 and 4 elongate ovate, two-fifths to one-third length of their segments. Brood lamellae with posterior margin of the anterior pair setose.

Colour (as preserved) yellowish white, with scattered reddish or purplish stellate specks, eyes reddish-brown.

Remarks. The discovery of adult ♂♂ and ♀♀ and juveniles in the same haul (no. 7) confirms the identification of the Terra Nova ♂ and ♀, and enables one to complete the diagnosis of the species.

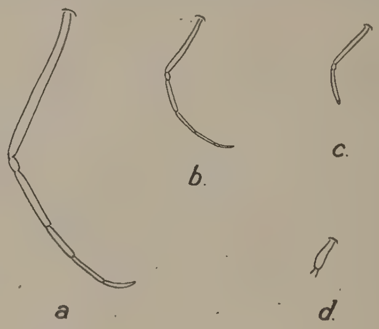

Fig. 169. Peraeopod 1 of: *a. Dodecas elongata*, *hexacentrum*, and *Dodecasella elegans*. *b. Dodecas reducta*. *c. Aeginoides gaussi*, aberration. *d. Aeginoides gaussi*, normal.

The tubercles or spines on the adults are evidently subject to variation. It would seem that the lamella on segment 4, which Schellenberg interpreted as the rudiment of peraeopod 2, is really the developing lateral tubercle of the adult.

Distribution. 65° 59′ S, 89° 33′ E, 350 m.; off Cape Adare and Oates Land, 82–366 m.

Aeginoides gaussi, Schell. (Fig. 169 *c*, aberration).

Occurrence: With other specimens from St. 195 as above.

Remarks. A single immature ♀, 20 mm. in length, found among the above-mentioned adult and young specimens of the typical form, is very interesting because it shows on what slender grounds some of the genera of this family are based.

In form, tubercles and other features it is indistinguishable from the typical specimens, but peraeopod 1 is composed of $3\frac{1}{2}$ joints. The terminal joint is minute. One can only regard this specimen as a casual aberration, a reversion to the ancestral form where the limb was composed of the normal number of joints. It helps to bridge a gap, and one can form a series from *Proto*, through *Dodecas* (*elongata* and *hexacentrum*), *Dodecas reducta* and this specimen, to the typical *Aeginoides* and *Caprellinoides*, in which latter all trace even of a rudiment of peraeopod 1 has disappeared.

Family CYAMIDAE

Lütken, 1873, p. 231; 1887, p. 317; 1893, p. 421.
Stebbing, 1888, pp. 155, 419 and 1647–1648.
Sars, 1895, p. 668.
Stebbing, 1910 *a*, p. 471.
Chevreux, 1913, p. 183.
Chevreux and Fage, 1925, p. 461.

The present collection is small, but important, because it contains the first recorded specimens of Whale-lice from a *Balaenoptera*. Lütken (1873) notes that no Whale-louse was known from a true Fin-whale (*Balaenoptera*); and the previous statements as to the presence of a species on the Cachalot remained unconfirmed until Pouchet in 1892 described *C. physeteris* (syn. *fascicularis*, Verrill, 1903). Moreover *P. boöpis*, the common louse on the Humpback, has now been found on a Sperm Whale.

As the Discovery Investigations deal primarily with whales, and Lütken's papers are not readily accessible in many libraries, no excuse is needed for introducing here descriptions and figures of the species represented in the collection.

The family contains four genera: *Cyamus*, with type *mysticeti*, Lütk. (= *ceti*, Linn., which, however, is better rejected as it is a composite species) from the Northern Right Whale; *Platycyamus*, Lütk. 1873, with type *thompsoni*, Gosse, from the Bottlenose (*Hyperoödon*); *Paracyamus*, Sars 1895, with type *boöpis*, Lütk.; and *Isocyamus*, Gerv. and Bened., with type *delphi*, Guér.

Mayer (1890, p. 146) has shown that the embryo of *nodosus* has a well-developed palp on the maxilliped, whereas in the adult the palp is rudimentary. Chevreux (1913, p. 183) has determined the same phenomenon in *erraticus*, and for this reason does not accept Sars' genus *Paracyamus*. Chevreux's argument if pushed to an extreme, i.e. attaching greater importance to juvenile, larval, or ultimately ovarian, characters, leads *ad absurdum*, and it seems legitimate and much more convenient to take the characters of the adult as of greater importance in determining the limits of genera. The genus *Paracyamus* is therefore retained here.

Genus **Cyamus**, Latr.

Stebbing, 1910 *a*, p. 471 (references).

Gnathopods 1 and 2 unequal. Antenna 2, 4-jointed. Maxilla 2 with outer lobes. Maxilliped, palp fully developed in adult. Dactylus and unguis of gnathopod 1 evenly tapering, the latter not distinct. Branchiae on segments 3 and 4, single or double, or fasciculate (*physeteris*—for figure of latter see Lütken, 1893), straight or spirally coiled.

Cyamus ovalis, R. de Vauz. (Fig. 170).

R. de Vauzème, 1834, p. 259, pl. viii, figs. 1–21.
Lütken, 1873, p. 267, pl. ii, fig. 4.
Stebbing, 1910 *a*, p. 472.

Occurrence: 1. Whale no. 503. South Georgia. Southern Right Whale. 8 ♂♂, 7 ♀♀ (some ovig., some with embryos), 3 juv.
2. Whale no. 1020. Saldanha Bay. Southern Right Whale. 1 ♂, 2 ♀♀ with embryos, 1 juv.

DESCRIPTION. General outline of peraeon in dorsal view rather broadly ovate. Head with oblique lateral groove indicating line of fusion with 1st peraeon segment, with a gibbous projection posteriorly, which is sharper in ♀ than in ♂ and fits in between the two gibbous processes on segment 2. Segment 2 massive, rather gibbous in front, with two small rounded dorsal protuberances, laterally with a backwardly directed hooked process. Segment 3 with anterior and posterior angles produced into lobes, the anterior larger than the posterior and somewhat hollowed dorsally for the reception of the process on segment 2. Segment 4 with postero-lateral angle subacutely produced. Segment 7 subtriangular, broader than long, hind margin straight.

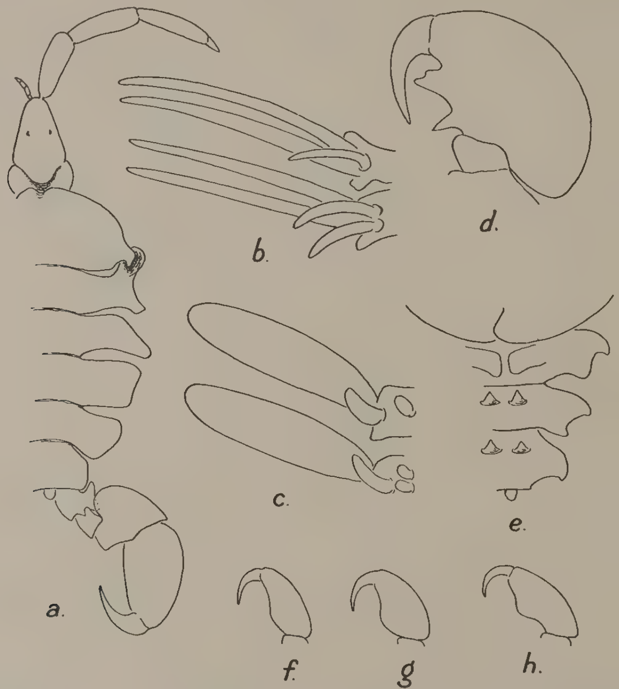

Fig. 170. *Cyamus ovalis*, R. de V. *a*. Dorsal view of ♂. *b*. Ventral view of branchiae of adult ♂. *c*. Ventral view of branchiae of juv. 4 mm. *d*. Gnathopod 2 ♂. *e*. Ventral view of peraeon segments 5–7 ♀. *f*. Gnathopod 1 juv. 4 mm. *g*. Gnathopod 1 immature ♂. *h*. Gnathopod 1 adult ♂.

On ventral surface faint indications of a pair of tubercles on both segments 6 and 7 in ♂; in ♀ a pair of conical tubercles on both segments 6 and 7, and on segment 5 a pair of oblong inwardly directed blunt processes.

Antenna 1, 1st–3rd joints subequal, slightly shorter than length of head plus 1st segment. Antenna 2 much shorter than 1st joint of antenna 1.

Gnathopod 1, 5th joint ovate with rounded bulge on inner margin, similar in both sexes. Gnathopod 2, 5th joint very massive, outer margin semicircularly convex, inner margin short, with two large teeth fairly close together, the one near the hinge obscurely bifid, similar in the two sexes, but the teeth closer together in the ♀.

Peraeopods 5–7 very strong and broadly expanded, 2nd joint with distal anterior corner not forming a pointed tubercle ventrally, 3rd feebly expanded, postero-inferior angle of 4th rounded-quadrate.

Branchiae double on both segments 3 and 4, about equal in length to peraeon segments 2–6 together, accessory appendages in ♂ about equal to head plus 1st segment, single on segment 3, double on segment 4; absent in ♀. In a juvenile ♂ 4 mm. long, there is a single stout, fairly long branchia on both segments 3 and 4, and a smaller one developing at its base, with very small accessory appendages; in a juvenile ♂ 2·5 mm. long, there is only a single short branchia on each segment. In the latter specimen the 2nd gnathopod already has the characteristic teeth developed.

Length: ♂ up to 16 mm., ♀ up to 12 mm.

Remarks. This species, with which *P. gracilis* seems invariably to occur, is recorded from the head region of the Southern Right Whale (*Balaena australis*), and by Lütken also from the North Pacific Whale (*B. japonica* ?).

Cyamus balaenopterae, Brnrd. (Fig. 171).

Barnard, 1931, p. 430.

Occurrence: 1. Whale no. 867. Saldanha Bay. Blue Whale. 2 ♂♂, 7 immat. ♀♀, 1 juv.
2. Whale no. 948. Saldanha Bay. Fin Whale. 2 ♂♂, 5 ♀♀ (2 with embryos), 1 juv
3. Whale no. 961. Saldanha Bay. Blue Whale. 1 ♂, 5 immat. ♀♀.
4. Whale no. 1096. Saldanha Bay. Fin Whale. 6 ♂♂, 3 ♀♀ (1 ovig.), 1 immat. ♀, 1 juv. *Types*.
5. Whale no. D 19. Durban. Fin Whale. 11 ♂♂, 8 ♀♀ (mostly immat.).

Description. General outline of peraeon in dorsal view narrow, parallel-sided in ♂, ovate in ♀. Head parallel-sided, completely fused with 1st segment, which is rounded laterally. Segment 2 with prominent neck in front, posterior margin sloping. Segments 3 and 4 lozenge-shaped in ♂, not much broader than long; in ♀ considerably broader than long, the antero-lateral angle of segment 4 produced in a rounded lobe. Segments 5 and 6 triangular or chevron-shaped. Segment 7 subcordate. Pleon with an unusually well-developed pair of oval processes.

On ventral surface in ♀ a pair of oblong, inwardly directed processes on segment 5, and a pair of pointed tubercles on both segments 6 and 7; in ♂ only the paired tubercles on segments 6 and 7, smaller than in ♀.

Antenna 1 nearly as long as head plus segments 1 and 2, shorter in ♀, 1st joint subequal to head, the other joints successively shorter. Antenna 2 extending about half length of 1st joint of antenna 1.

Maxilliped with fully-developed palp in adult.

Gnathopod 1, 5th joint ovate, with prominent rounded tooth on inner margin.

Gnathopod 2, 5th joint ovate, with a pointed tooth near base and an obliquely truncate broader tooth near hinge on inner margin. In ♀ both gnathopods are similar to those of ♂ but not quite so strong.

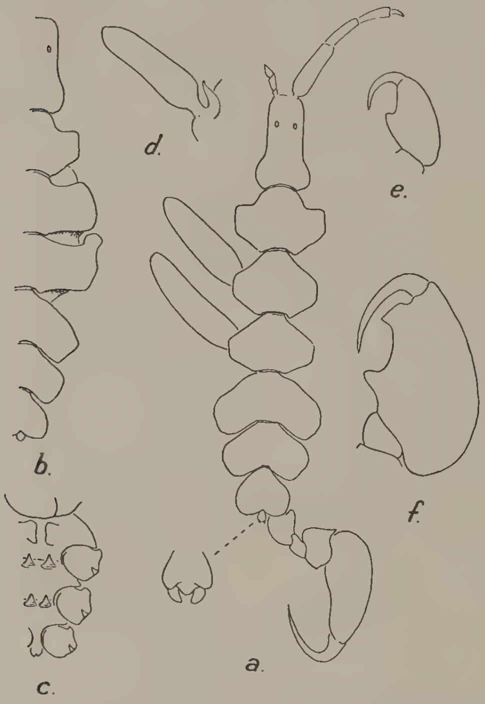

Fig. 171. *Cyamus balaenopterae*, Brnrd. *a*. Dorsal view of ♂, with pleon further enlarged. *b*. Dorsal view of ♀. *c*. Ventral view of peraeon segments 5–7 ♀, with proximal joints of peraeopods 5–7. *d*. Branchia ♂. *e*. Gnathopod 1 ♂. *f*. Gnathopod 2 ♂.

Peraeopods 5–7 not very strongly expanded, distal anterior corner of 2nd joint produced ventrally as a sharp tubercle, stronger in ♀ than ♂, 3rd joint feebly expanded, 4th with antero-distal angle sharp and turned outwards, 6th narrow-ovate, inner margin very slightly sinuous, dactyl strongly curved.

Branchiae single on both segments 3 and 4, short, about as long as segments 2 and 3 together, stout, accessory appendage in ♂ a short pointed process, single on both segments; in ♀ absent.

Length: ♂ 8·5 mm., ♀ 8 mm.

Colour (as preserved) dull pinkish brown, eyes black.

REMARKS. A very distinct species. In having unusually well-developed processes on the rudimentary pleon it resembles *physeteris*. The dactyls of peraeopods 5–7 also somewhat resemble those of the species just mentioned in their strongly drepaniform curvature.

Genus **Paracyamus**, G. O. Sars.

Sars, 1895, p. 669.

Gnathopods 1 and 2 unequal. Antenna 2, 4-jointed. Maxilla 2 with outer lobes. Maxilliped, palp well-developed in young, but rudimentary in adult. Dactylus and unguis of gnathopod 1 evenly tapering, the latter not distinct. Branchiae single on both segments 3 and 4.

Paracyamus erraticus (R. de Vauz.) (Fig. 172).

R. de Vauzème, 1834, p. 259, pl. viii, figs. 22, 23.
Lütken, 1873, p. 260, pl. iii, fig. 5.
Stebbing, 1910 *a*, p. 472.
Chevreux, 1913, p. 183, fig. 62 (maxilliped).

Occurrence: Whale no. 1020. Saldanha Bay. Southern Right Whale. 8 ♂♂, 10 ♀♀ (ovig. and with embryos), several juv.

Description. General outline of peraeon in dorsal view ovate. Head frequently with a distinct notch or groove where it is joined with 1st segment, tapering anteriorly in ♂, in ♀ more parallel-sided. Segment 1 gibbous laterally, more so in ♂ than in ♀, the antero-inferior angle pointed, more prominent in ♀ than in ♂. Segment 2 with postero-lateral angle forming a forwardly directed hooked process in both sexes. Segments 3 and 4 bluntly produced at postero-lateral angles. Segment 7 subtriangular, broader than long, hind margin straight.

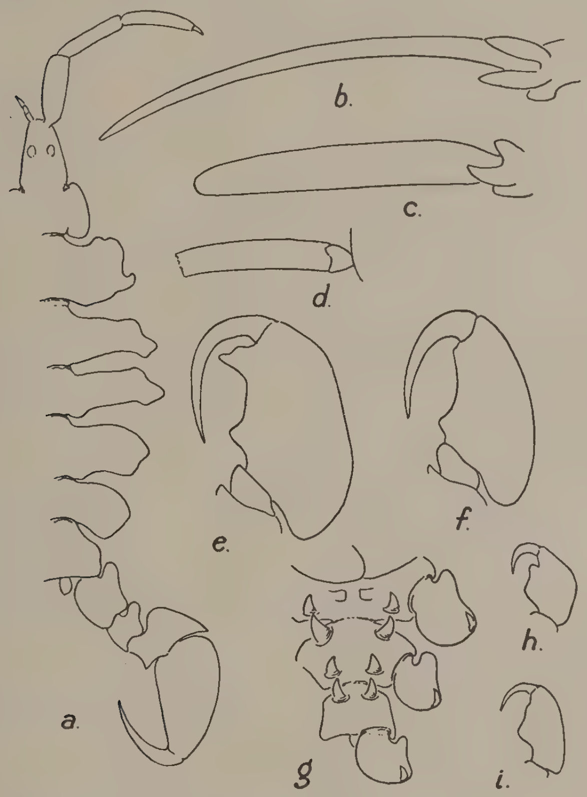

Fig. 172. *Paracyamus erraticus* (R. de V.). *a.* Dorsal view of ♂. *b.* Branchia adult ♂. *c.* Branchia juv. 4–5 mm. *d.* Branchia ♀. *e.* Gnathopod 2 ♂. *f.* Gnathopod 2 ♀. *g.* Ventral view of peraeon segments 5–7 ♀, with proximal joints of peraeopods 5–7. *h.* Gnathopod 1 ♂. *i.* Gnathopod 1 ♀.

On ventral surface in ♀ a pair of blunt inwardly directed processes on segment 5 and also behind them a pair of pointed tubercles, on segment 6 two pairs of pointed tubercles, and on segment 7 one pair of pointed tubercles; in ♂ only one pair of tubercles, much smaller than in ♀, on each of segments 5, 6 and 7.

Antenna 1, 1st–3rd joints subequal, and subequal to head (excluding segment 1). Antenna 2 much shorter than 1st joint of antenna 2. Maxilliped in a juvenile 5 mm. long with fully-developed palp.

Gnathopod 1, 5th joint subquadrangular in ♂, with a rounded tooth followed by a notch near hinge; in ♀ ovate, the inner margin only slightly undulate. Gnathopod 2, 5th joint in ♂ with two large teeth on inner margin, one near base, the other near hinge, the latter obscurely bifid; in ♀ the two teeth are only feebly developed, the basal one more prominent than the distal one.

Peraeopods 5–7, distal anterior corner of 2nd joint produced ventrally to form a pointed tubercle, more prominent in ♀ than in ♂, 3rd moderately expanded, not as wide as 2nd or 4th joints, postero-inferior angle of 4th acute.

Branchiae very long, nearly (♀) or quite (♂) as long as peraeon segments 2–7 together, single on both segments 3 and 4, accessory appendages in ♂ double on both segments, in length about equal to head (excluding 1st segment); in ♀ only a single short sub-bifid lobe; in juveniles (4–5 mm.) the branchiae are relatively much stouter.

Length: ♂ up to 15 mm., ♀ up to 10 mm.

Remarks. This species was recorded by Lütken from the Southern Right Whale, and by Stebbing from the tail region of the same species of whale. Stebbing also recorded it from the Humpback.

Paracyamus boöpis (Lütk.).

Lütken, 1873, p. 262, pl. iii, fig. 6 and p. 264, pl. iii, fig. 7 (*pacificus*).
Sars, 1895, p. 669, pl. ccxl.
Stebbing, 1910 *a*, p. 473.
Pesta, 1928 (*Ann. Nat. Mus. Wien*, XLII), pp. 79, 82, fig. 1 *h*, *i*.

Occurrence: 1. Whale no. 355. South Georgia. Humpback. 1 ♂, 2 ♀♀ (all immat.).
2. Whale no. 373. South Georgia. Humpback. 6 ♂♂, 1 ovig. ♀.
3. Whale no. 387. South Georgia. Humpback. 2 ♂♂, 2 ovig. ♀♀, 3 immat. ♀♀, 2 juv.
4. South Shetlands. Humpback. 3 ♂♂, 3 ♀♀ (1 ovig.), several juv.
5. Whale no. 918. Saldanha Bay. Humpback. 10 ♂♂, 7 ♀♀ (none quite mature), 2 juv.
6. Whale no. 1125. Saldanha Bay. Humpback. 6 ♂♂, 4 ♀♀ (1 with embryos), several juv.
7. Whale no. D 3. Durban. Humpback. 11 ♂♂, 1 immat. ♀, 1 juv.
8. Whale no. D 21. Durban. Sperm Whale. 2 ♂♂, 3 ovig. ♀♀, 1 ♀ with embryos.

Remarks. The only difference between this species and *erraticus* lies in the ventral tubercles on segments 5–7. In the ♀ there is only one pair on each of the segments, and in the ♂ only one pair on each of segments 6 and 7 (the blunt processes on segment 5 are present in the ♀, as in *erraticus* and other species). It does not appear to reach so large a size as *erraticus*; the body also tends to be more slender, and the branchiae not so elongate. *C. pacificus* Lütk. is certainly synonymous.

This species has been recorded from the Humpback, and a var. *physeteris* from the Cachalot. Lütken (1893) says that the latter record is based on the statement of a whaler. It is therefore interesting to find a sample in the present collection taken from the Sperm Whale.

Paracyamus gracilis (R. de Vauz.) (Fig. 173).

R. de Vauzème, 1834, p. 259, pl. viii, figs. 24, 25.
Lütken, 1873, p. 278, pl. iv, fig. 10.
Stebbing, 1910 *a*, p. 473.

Occurrence: Whale no. 503. South Georgia. Southern Right Whale. 1 ♂, 6 juv.

Description. General outline of peraeon in dorsal view nearly parallel-sided. Head plus segment 1 triangular, with only a slight lateral groove marking the line of fusion. Segment 2 with antero-lateral angle rounded, postero-lateral angle quadrate. Segments 3 and 4 with a shallow notch on lateral margins. Segments 5 and 6 with a notch on lateral margin near anterior corner, slightly concave farther posteriorly. Segment 7 subtriangular, slightly broader than long, postero-lateral margin with a notch, hind margin concave.

On ventral surface in ♀ a pair of blunt inwardly directed processes on segment 5; no pointed tubercles either in ♂ or ♀.

Antenna 1, 1st–3rd joints subequal or 3rd slightly shorter, 1st about half length of head plus 1st segment. Antenna 2 extending almost as far as apex of 1st joint of antenna 1. Maxilliped, palp rudimentary even in a juvenile of 4 mm., but fully developed in one of 2 mm.

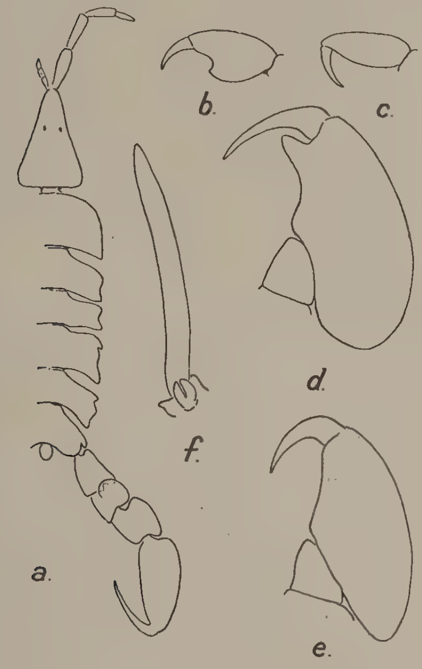

Fig. 173. *Paracyamus gracilis* (R. de V.). *a.* Dorsal view of ♂. *b.* Gnathopod 1 ♂. *c.* Gnathopod 1 ♀. *d.* Gnathopod 2 ♂. *e.* Gnathopod 2 ♀. *f.* Branchia ♂.

Gnathopod 1, 5th joint in ♂ ovate with prominent rounded tooth on inner margin; in ♀ narrow ovate, margin even. Gnathopod 2, 5th joint in ♂ with prominent pointed tooth on inner margin near hinge; in ♀ inner margin nearly straight, without tooth.

Peraeopods 5–7 not very strongly expanded, no ventral point on antero-distal corner of 2nd joint, 3rd joint as broad as 2nd, and only a little less broad than 4th, which has antero-distal corner rounded or at most subacute (not acute) and postero-inferior angle rounded, not prominent, 5th joint narrow ovate.

Branchiae single on both segments 3 and 4, rather thick, equal in length to peraeon segments 3–5 together, shorter in ♀; accessory appendages in ♂ short, double on both segments, absent in ♀.

Length: ♂ up to 10 mm., ♀ up to 8 mm.

Remarks. The above description is based on South African specimens in the South African Museum. This species seems to be always inextricably mixed up with the individuals of *Cyamus ovalis*. They appear to be confined to the head region of the whale.

Genus **Isocyamus**, Gerv. and Bened.

Gervais and Beneden, 1859 (*Exp. Meth. Règne Anim.*, 1), quoted from Stebbing, 1888, p. 316.

Gnathopods 1 and 2 unequal. Antenna 2 reduced to three joints. Maxilla 2 without outer lobes. Maxilliped, lobes fused, without trace of palp. Unguis of gnathopod 1 distinct from the dactylus. Branchiae single on both segments 3 and 4.

Remarks. Although the characters of this genus were not stated by the original authors, the type, *delphini*, was designated. The genus may well be resuscitated on the above characters.

Isocyamus delphini (Guér.) (Fig. 174).

Guérin-Méneville, 1836 (*Iconogr.*, III), p. 25, pl. 28, fig. 5.
Stebbing, 1888, p. 163.
Milne Edwards, 1840 (*Hist. Nat. Crust.*, III), p. 114.
Brandt, 1872 (quoted from Stebbing, 1888).

Lütken, 1873, p. 276, pl. iv, fig. 9.

Mayer, 1882, pp. 186, 187, text-figs. 37, 38; 1890, pp. 147, 150, pl. vi, figs. 43, 44; pl. vii, fig. 19 (*globicipitis*).

Chevreux, 1913 *a*, p. 15 (*globicipitis*).

Chevreux and Fage, 1925, p. 462, fig. 438 (*globicipitis*).

Occurrence: 1. St. 14° 45′ N, 18° 24′ W. 27. x. 25. On Dolphin A. 4 ♂♂, 5 ♀♀ (some with embryos), 4 immat. ♂♂, 2 immat. ♀♀.

2. Same station. On Dolphin B. 1 ♂, 1 ovig. ♀, 3 immat. ♀♀, 8 juv.

Description. General outline of peraeon in dorsal view ovate in both sexes, the ♀ not broader than the ♂. Head and segment 1 completely fused, short, strongly bent downwards. Eyes present (as in other species). Peraeon segment 2 embracing base of segment 1. Segments 3 and 4 broader than segment 2 (no specimens with these narrower, as in Chevreux and Fage's figure).

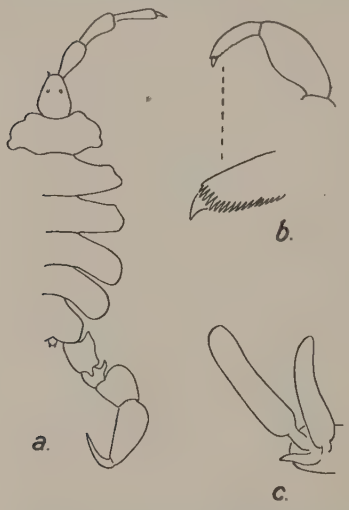

Fig. 174. *Isocyamus delphini* (Guér.). *a*. Dorsal view of ♂. *b*. Gnathopod 1 ♂, with dactyl and unguis further enlarged. *c*. Branchia ♂.

On ventral surface in ♀ a pair of blunt inwardly directed processes on segment 5, and a pair of pointed tubercles on both segments 6 and 7; in ♂ a pair of tubercles on each of segments 5–7; more strongly developed than in ♀.

Antenna 1, 1st and 2nd joints obovate, widening distally. Antenna 2 very small.

Gnathopod 1, 5th joint ovate, 6th distally pectinate, unguis distinct. Gnathopod 2, 4th joint prominently projecting on inner (lower) side, apically rounded, 5th with a single strong pointed tooth on inner margin near hinge.

Peraeopods 5–7, 2nd joint without projecting apical tubercle on lower surface, 3rd with anterior margin acutely produced, 4th broadly pyriform, distal angles not prominent.

Branchiae single on both segments 3 and 4, short and stout, accessory appendages in ♂ similar to and almost as long as the branchiae themselves, single on each segment, absent in ♀; at the base of each branchia is a pointed process, directed outwards, in both sexes.

Length: ♂ 6·5 mm., ♀ 6 mm.

Remarks. Both Brandt and Lütken were inclined to regard *globicipitis* and *delphini* as synonymous. *C. chelipes*, Costa, 1866 (*Ann. Mus. Napoli.*, III, p. 82, pl. iv, fig. 2), also found on a dolphin, appears to be distinct from the present species; but whether it belongs to the genus *Isocyamus* is impossible to tell, as the description is inadequate.

The present species has been recorded from Dolphins and the Black Fish (*Globicephalus melas*); also from *Grampus griseus* and *Pseudorca crassidens* near the Azores (Chevreux, 1913 *a*).

APPENDIX

The following species are included in a small collection made at South Georgia by Major Barrett-Hamilton (P. Stammwitz, collector), and submitted to me by Dr Calman of the British Museum.

The species are all well known but this is the first record of *Paramoera walkeri* from South Georgia.

Cheirimedon femoratus (Pfr.).

Supra, p. 48.

Occurrence: Cumberland Bay, 10–15 fathoms. Dec. 1913. Six specimens, 8 mm.

Oradarea tridentata, Brnrd.

Supra, p. 163.

Occurrence: King Edward Cove. 12. xi. 13. Four specimens, 8–11 mm., incl. 2 ovig. ♀♀.

Bovallia gigantea, Pfr.

Supra, p. 196.

Occurrence: King Edward Cove. 12. xi. 13. 3 ♂♂ 20–24 mm., 15 ♀♀ 20–45 mm.
Cumberland Bay. Dec. 1913. 4 ♀♀ 27–30 mm.
Leith Harbour. 1 ♂ 25 mm., 1 ♀ 28 mm.

Eurymera monticulosa, Pfr.

Supra, p. 198.

Occurrence: Cumberland Bay, 10–15 fathoms. Dec. 1913. 1 ♀ 21 mm.

Djerboa furcipes, Chevr.

Supra, p. 203.

Occurrence: Cumberland Bay. Dec. 1913. 2 ♀♀ (1 ovig.) 16 mm.

Paramoera walkeri (Stebb.).

Supra, p. 206.

Occurrence: Cumberland Bay. Dec. 1913. Four specimens, incl. 2 ♀♀ with embryos 11–12 mm., in poor condition.
King Edward Cove. 12. xi. 13. 1 ♀ 17 mm.

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PLATE I

Coloured figures of Amphipoda made from living specimens on board the R.R.S. 'Discovery' and R.R.S. 'William Scoresby'.

Figs. 1, 3–8, A. C. Hardy pinx.; Fig. 2, E. R. Gunther pinx.

Fig. 1. *Katius obesus*, Chevr., from St. 101: × 3.

Fig. 2. *Epimeria acanthurus*, Schell., from St. WS 85: × 8.

Fig. 3. *Epimeriella macronyx*, Wlkr., from St. 162: × 4.

Fig. 4. *Eusiroides stenopleura*, n.sp., from St. 114: × 3.

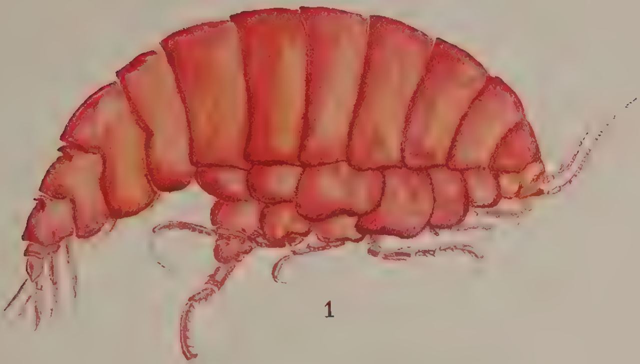
Fig. 5. *Pegohyperia princeps*, Brnrd., from St. 85: × 3.

Fig. 5*a*. *Pegohyperia princeps*, Brnrd., from St. 85: front view of head × 3.

Fig. 6. *Eupronoë minuta*, Claus, from St. 266: × 16.

Fig. 7. *Brachyscelus rapax*, Claus, from 25° 47′ S, 14° 48′ W: × 12·5.

Fig. 8. *Primno macropa*, Guér., from St. 105: × 7.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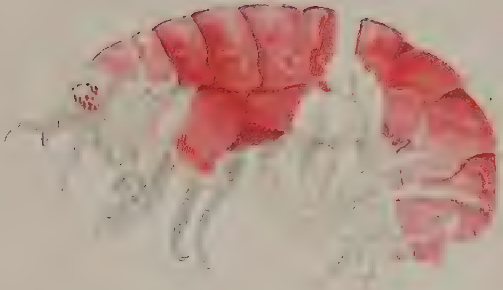
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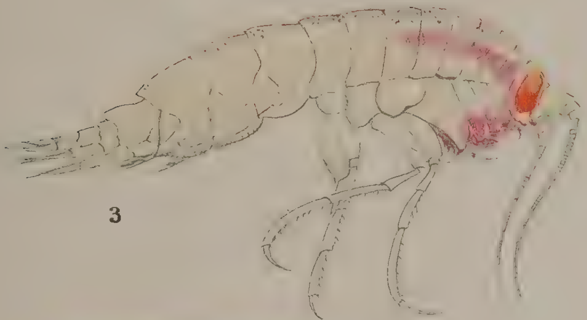
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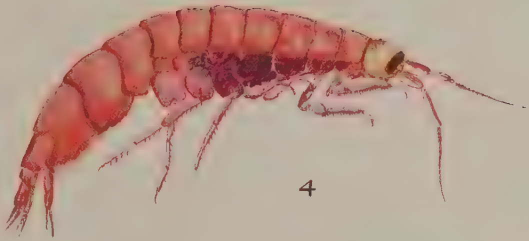
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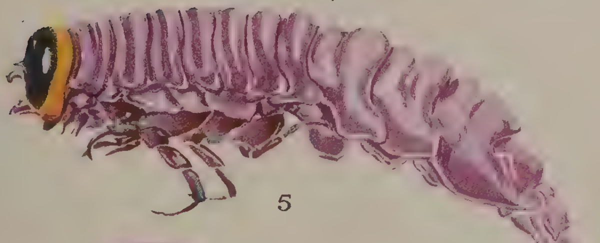
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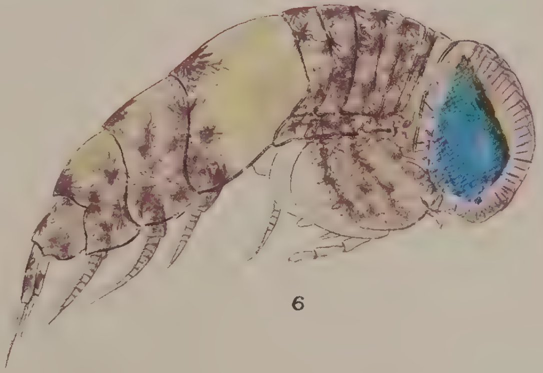
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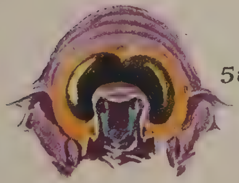
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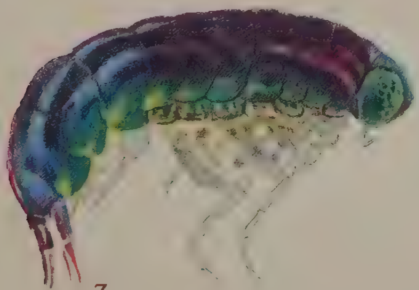
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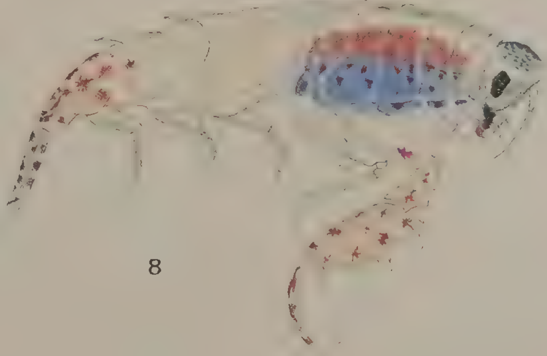
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THE VASCULAR NETWORKS (RETIA MIRABILIA) OF THE FIN WHALE *(BALAENOPTERA PHYSALUS)*

By

F. D. OMMANNEY, A.R.C.S., B.Sc.

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THE VASCULAR NETWORKS (RETIA MIRABILIA) OF THE FIN WHALE *(BALAENOPTERA PHYSALUS)*

By F. D. Ommanney, A.R.C.S., B.Sc.

(Text-figs. 1–10)

INTRODUCTION

Vascular networks lining the thorax of Cetacea were mentioned by Hunter (1787, pp. 371–450) who wrote of them as follows: "The general structure of the arteries resembles that of other mammals and where parts are nearly similar their distribution is likewise similar. The aorta forms its usual curve and sends off the carotid and subclavian arteries. Animals of this tribe, as has been observed, have a greater proportion of blood than any other known and there are many arteries apparently intended as reservoirs where a large quantity of arterial blood seemed to be required in a part and vascularity could not be the only object. Thus we find the intercostal arteries divide into a great number of branches in a serpentine course between the pleural ribs and their muscles—making a thick substance similar to that formed by the spermatic artery in the bull".

"These vessels, everywhere lining the sides of the thorax, pass in between the ribs near their articulation and also behind the ligamentous attachments of the ribs and anastomose with each other. The medulla spinalis is surrounded with a network of arteries in the same manner, more especially where it comes out from the brain, where a thick substance is formed by their ramifications and convolutions, and these vessels most probably anastomose with those of the thorax."

Since Hunter's time these vascular networks have been noticed by many anatomists.

Breschet (1836) described at some length a mass of vessels in the thorax of *Delphinus* (= *Phocaena*) *phocaena*. "Il existe sur l'un et l'autre côté de la colonne rachidienne au-devant des côtés, derrière les plèvres, depuis le sommet jusqu'à la base de la poitrine, au-dessus du diaphragme, un vaste plexus vasculaire, auquel nous devons, d'après sa disposition, reconnaître trois faces, trois bords et trois extremités." Breschet noticed that intercostal nerves, sympathetic branches and ganglia were in connection with the plexus. This author states definitely that the plexus is arterial in constitution. "In all the intrathoracic part of the plexus veins are not discernible except as rare and small branches." He continues: "From the posterior part of the plexus a number of prolongations penetrate to the neural canal and form a plexus on the posterior part of the spinal 'marrow' comparable to the spinal plexus in man—except that in man the plexus is essentially formed by veins while in whales it is almost all artery".

Stannius (1841) mentioned the network only very briefly in the course of a description of the arteries of *Phocaena phocaena*.

Carte and Macalister (1868) noted the plexus in *Balaenoptera rostrata* (= *B. acutorostrata*). They found it mainly in the cervical region, within the rings formed by the transverse apophyses of the cervical vertebrae. It reached behind as far as the fourth dorsal vertebra. They noted that the plexus sent prolongations into the neural canal.

Owen (1868), who gave to the networks the name "Retia Mirabilia", in his *Comparative Anatomy of the Vertebrates* described the rete in the porpoise as an "arterial structure, formed chiefly by the intercostal arteries, lining the sides of the thorax from the ninth and tenth pairs of ribs forwards, penetrating between the ribs near their joints and behind the costal ligaments and there anastomosing with corresponding productions from contiguous intercostal spaces; branches pass therefrom into the neural canal surrounding the myelon with a similar plexus increasing in thickness near the skull and about the macromyelon, anastomosing freely with the myelonal meningeal arteries". Owen also mentioned a similar arterial plexus in the Piked Whale (*Balaenoptera acutorostrata*) to which the internal mammary arteries also contribute.

Turner (1872) mentioned the rete briefly in his description of the Blue Whale dissected by him, and noted that the plexus was not confined to the thorax but extended also into the neck and that prolongations were traceable into the spinal canal.

Murie (1873) described various plexuses in the Ca'aing Whale (*Globicephala melaena*). He mentioned a large network on the basis cranii from the tympanic bone forwards to the maxillary and in the infundibular cavity of the mandible, and another at the root of the Eustachian tube with capillaries connecting into a jugular channel. Mention was also made of a deep lumbar plexus, described also by Owen in the porpoise, underlying the lumbo-caudal muscles and "communicating with the two immense veins lying on either side of the spinal cord". The plexuses, according to Murie, are essentially composed of both arteries and veins.

An excellent description of the rete mirabile of the Narwhal was given by Wilson (1879). This author gave some description of the relation of the organ to the nerves of the cervical and thoracic regions and was of the opinion that it is both venous and arterial in constitution.

Bouvier (1889), after summarizing the observations of Turner, Owen and Carte and Macalister, proceeded to a description of the plexus in the dolphin (*Delphinus delphis*). The intercostals, of which there are fifteen pairs, are all (except the first two pairs) given off separately by unpaired trunks from the aorta. These are long in front and short behind. Each bifurcates to give the corresponding intercostals. The two anterior pairs of intercostals are given off by the thoracic arteries. The first intercostal of the succeeding aortic series forms a plexus which is extraordinarily thick at the anterior extremity of the thoracic cavity. Behind, it becomes very narrow and thin. Bouvier also described and figured the plexus in *Balaenoptera rostrata*. He observed that the arteries outside the plexus, but still very close to it, manifest a tendency to plexus disposition. They give off minute arterioles which anastomose together and come into relation with the plexus itself. In *B. rostrata* and in all Mystacocetes, according to Bouvier, the plexus is formed by intercostals given off from the thoracic artery. The anterior of these breaks up entirely to form the plexus, while the more posterior ones do not, but send branches outside it towards the region of the mammary artery.

Bouvier had convinced himself by dissection and injection that the plexus is arterial. Breschet and Owen were also emphatic in their statement of its arterial constitution. Murie, as has been mentioned, considered that it is made up of both arterial and venous components. Carte and Macalister, however, were definitely of the opinion that the plexus is mainly venous.

THE THORACIC RETE

In order to make clear the structure and relationships of the vascular masses designated the "Rete Mirabile" by Owen, two Fin Whale foetuses were dissected at South Georgia—one 0·86 metre (male) and the other 1·73 metres (female). The major part of the dissection was carried out on the larger of these. However, many of the blood vessels included in the following description, as well as the nerves in the neck region, were made out only in the smaller foetus, since the other had to be decapitated before it could be transported across to the laboratory from the whaling factory.

APPEARANCE OF THE RETE

During the dismemberment of the adult carcass on the flensing plan, the rete can be seen as a series of fatty masses between the transverse processes of all the cervical and the first six dorsal vertebrae. These fatty masses contain, embedded within their substance, very numerous small thick-walled blood vessels. There can also be seen in the centre of each mass a large vessel which has thin walls and is evidently venous—it passes through the mass from the direction of the spinal cord. These large veins, when opened with a knife, are found to receive numerous small vessels on all sides from the substance of the fatty mass of the rete.

In the smaller of the two foetuses dissected the fineness of the component threads of the rete gave the organ the appearance of a diffuse gland, pink in colour and fairly compact and dense in texture, immediately anterior to the thoracic cavity. In the larger foetus it was seen quite clearly to be made up of a mass of minute blood vessels of capillary size. The network enclosed very numerous fine nerve fibres in its meshes. It was seen to be everywhere quite independent of surrounding muscles, but lay in more intimate contact with the anterior two pairs of intercostals, as will be pointed out later in this paper. It was invested by its own thin connective tissue integument and could be easily dissected away from neighbouring tissues. Wherever an artery passed through it, many smaller branches could be seen running from that vessel into the rete, and similarly minute veins were seen running into the venous channels on whose course the rete lay. In many places special retial arteries and veins extended outwards from the major vessels to various parts of the retial mass. Nowhere, however, was the free flow of blood through any part of the thoracic vascular system, arterial or venous, in any way impeded by the anastomosing strands of the rete. The rete communicated freely with the blood vessels with which it stood in relation, but did not form an integral part of them.

Wilson (1879) in describing the thoracic rete of the Narwhal distinguished three types of constituent vessels:

Vasa maxima—vessels of large calibre with thin puckered walls. These were mainly situated in the inferior aspect of the rete towards its posterior extent.

Vasa media—smaller in calibre than the vasa maxima and more generally distributed throughout the mass. The walls of these were also puckered.

Vasa minima—much smaller than the preceding with proportionately thick walls. They were found deeply embedded in the rete.

In the Fin Whale it was not possible to divide the constituent vessels of the rete into three such definite classes: indeed, Wilson stated that intermediate sizes between the three named were found also in the Narwhal. However, in the Fin Whale large venous channels with thin walls were certainly found running through the substance of the mass and these, as will be seen later, tended to converge towards the posterior thoracic vein and thus lay somewhat posterior and inferior in position. These perhaps were the vasa maxima of Wilson. Secondary smaller venous twigs were also seen which may correspond to the vasa media and the main mass of the retia was made up of much smaller vessels with thick walls which may be looked upon as vasa minima. There were, however, an infinity of gradations between the three sizes. The sinuosities of the component vessels of the retia were much too complicated to unravel by dissection.

POSITION AND RELATION TO MUSCLES

Some account of the anatomy of the ventral aspect of the neck must be given in order to explain the positions of the various parts of the rete and their relationships.

The arrangement of the muscles of the neck was found to be the same as that described by Schulte for the Sei Whale (*Balaenoptera borealis*).

Schulte says (p. 425): "In the neck a great muscle complex is formed.... The complex is of great size and extends its insertion far upon the basis cranii as well as its origin upon the ribs and spine. From these two sources the fasciculi converge and unite inside the arch of the first rib thus extending as a single mass"—on each side—"to the skull. So that the whole complex has the form of an inverted Y"—on each side—"the diverging arms of which embrace the dome of the pleura and limit its extension rostrad" (Fig. 1). The lateral arm of the Y is the scalene muscle and arises chiefly from the external surfaces of the first three ribs and also in part from the fourth and fifth (Fig. 1). The mesial arm of the Y is divisible into a massive "superficial portion extending from the thoracic (dorsal) vertebrae to the basi-occipital" and a dorsal portion confined to the spine. The superficial and more ventral portion enters into relation with the scalene to form the stem of the Y continuing on to the skull. It was identified

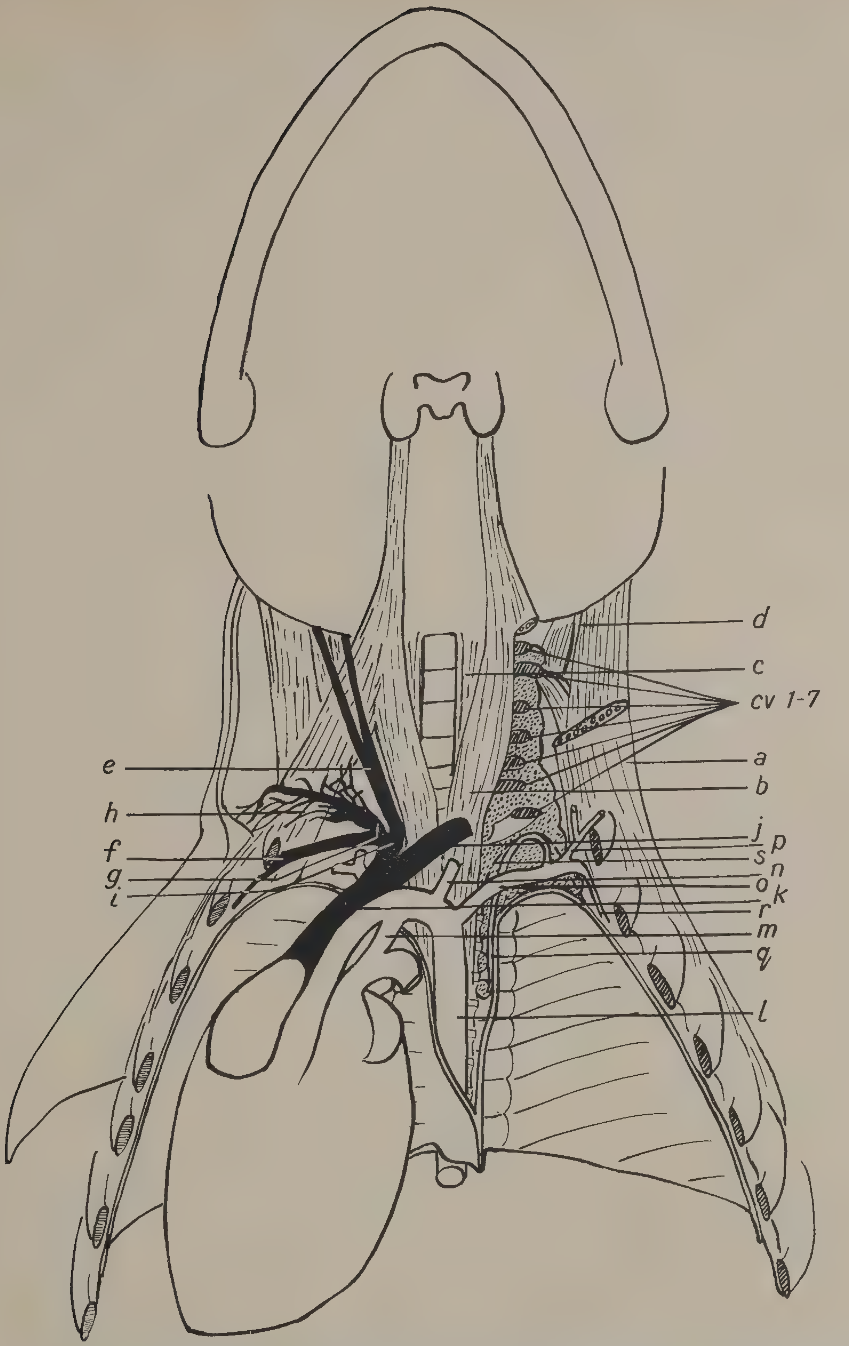


Fig. 1. Showing the position of the great thoracic rete with relation to the scalene muscle, thoracic cavity and cervical vertebrae. Rete dotted.

a, Scalene muscle
b, Rectus capitis anticus major muscle
c, Longus colli muscle
d, Trachelo-mastoid and splenius muscles
e, Jugular vein
f, Posterior thoracic and internal mammary veins
g, Brachial vein
h, Axillary venous plexus
i, Right brachio-cephalic vein
j, Left brachio-cephalic vein
k, Precava
l, Dorsal aorta
m, Ductus arteriosus
n, Carotid artery
o, Subclavian artery
p, Axillary artery
q, Posterior thoracic artery
r, Internal mammary artery
s, Line of anterior extension of the pleural dome
cv 1–7, Transverse processes of the cervical vertebrae

by Schulte with the rectus capitis anticus major muscle. The deeper and more dorsal portion was identified with the longus colli and is restricted to the bodies of the vertebrae. In both the foetuses dissected the scalene and rectus capitis anticus major were found to converge and unite somewhat anterior to the first rib (which is attached to the 7th cervical vertebra) at about the level of the 5th and 6th cervical vertebrae. Caudally the rectus capitis expands to a considerable belly opposite the first rib, and then diminishes to be inserted into the ventral surfaces of the first three or four dorsal vertebrae as far back as the point of contact of the dorsal aorta with the vertebral column. Fig. 1 shows the relations of these two muscles and the Y formed by them embracing the anterior extension of the thorax. It is seen that rostrally the two fused muscles, scalene and rectus, passing somewhat inwards and ventrally to their insertions into the skull, give place in the fore part of the neck to a complex of muscles composed of the splenial mesially and the trachelo-mastoid laterally (*d*). The former runs from the cervical neural spines to the squamosal bone and the latter from the dorsal parts of the first ribs to the squamosal.

Fig. 1 also shows the heart turned aside to show the dorsal aorta (*l*), the ductus arteriosus (*m*) and the pulmonary artery. The lungs and most of the vessels on the left side of the neck have been omitted for the sake of clarity. The left subclavian, brachial and axillary arteries (*p*) are shown. The venous system is drawn somewhat displaced by the turning aside of the heart, but the "axillary venous plexus" is drawn in its normal position.

The whole fork of the Y formed by the scalene (*a*) and the rectus capitis anticus (*b*) is occupied by the main mass of the rete mirabile (Fig. 1, dotted) which thus forms an irregular triangular mass. In Fig. 1 the pecked line (*s*), running through the dotted area representing the rete, marks out the extreme anterior limit of the pleural dome. Around its anterior aspect runs the posterior thoracic artery (*q*) and the posterior thoracic vein, which has been omitted for the sake of clearness.

One side of the triangle formed by the rete between the rectus and the scalene muscles—the mesial side—rests dorsally against the vertebral column (*cv*) and ventrally against the rectus anticus muscle. Where the rete lies against the vertebral column it extends between the heads of the ribs and between the transverse processes, coming into contact at these points with the overlying dorsal musculature. It is found extending up into the neural canal through the intervertebral foramina, as was noted by Turner. The laterally directed side of the retial triangle lies against the scalene muscle, while behind it overlies the first intercostal space. The caudally directed side lies against the anterior extremity of the dome of the pleural cavity underneath the pleural lining (Fig. 1).

The mesial relations of the rete to the vertebral column and the rectus capitis muscle and the lateral relations to the scalene are further shown in Fig. 2. This schematic diagram represents a transverse section through the posterior neck region. In section the scalene muscle (*c*) is shown to be somewhat arched for its insertion upon the ribs, so that in front of the ribs its ventral face is nearly in contact with the rectus capitis anticus major (*e*), leaving only a small slit, widening caudally, between itself and that muscle. In front, therefore, of the thorax the scalene forms a large part of the ventral boundary of the rete as well as the rectus. Through the slit the rete protrudes, so as to come into brief contact with the subclavian artery (*g*) and the sterno-mastoid muscle (*d* 1).

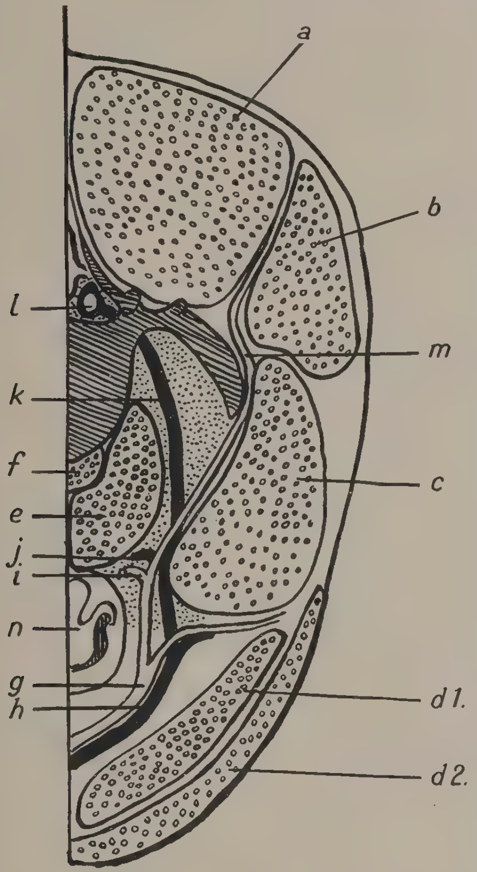


Fig. 2. Diagrammatic transverse section through the base of the neck, showing the main mass of the Rete (dotted) and its relation to the muscles and the vertebral column.

a, Semispinalis muscle
b, Longissimus dorsi muscle
c, Scalene muscle
d 1, Sterno-mastoid muscle
d 2, Sterno-mandibularis muscle
e, Rectus capitis anticus major muscle
f, Longus colli muscle
g, Subclavian artery
h, Brachiocephalic vein
i, Posterior thoracic artery
j, Posterior thoracic vein
k, Intraspinous vein
l, Neural sinus
m, Ascending artery
n, Trachea and oesophagus

The shape of the thoracic cavity is peculiar in the Cetacea. The diaphragm is very obliquely set and the ventral line of the cavity is far longer than the dorsal. The thorax projects far forward on each side in front of the heart and the great vessels, so that two domes of the thoracic cavity—the pleural domes—extend forward above the subclavian arteries nearly to the posterior face of the first rib. The forward extension of the dome is represented by the dotted line above mentioned on the right side of Fig. 1. The caudal aspect of the pyramidal retial mass—the posterior side of the triangle—lies very close against this forward extension of the thorax underneath the pleural lining. It is therefore markedly concave in outline. It overlies the whole of the first intercostal area and the proximal third of the second, lying between the pleuron and the intercostal muscle.

The main body of the retial mass occupies the length of the vertebral column from the 1st cervical to the 4th dorsal vertebra and has the relations to the vertebrae already outlined. Between the 1st and 2nd cervical vertebrae there is a large lobe of the retial substance which communicates with the main body of the rete only by a neck passing through the foramen of the transverse process of the 2nd cervical vertebra. This portion is in relation laterally with the splenial and trachelo-mastoid muscle complex, and not with the scalene, which has passed mesially to its insertion upon the basis cranii. Posteriorly, between the transverse process of the 4th and 5th and the 5th and 6th dorsal vertebrae, two further lobes of vascular network, apparently isolated from the main body, were found in the larger foetus (Fig. 1). In the smaller they appeared to be joined to the main mass of the rete, forming a continuous band of the retial mass extending along the heads of the ribs as far as the 6th dorsal vertebra. In adult whales also these last two lobes appear to be isolated, so that the rete may be said to extend pretty continuously from the 1st cervical to the 6th dorsal vertebra.

RELATION TO BLOOD VESSELS

The blood leaves the heart by the great aortic arch, which curves over the root of the left lung as described by Turner (Fig. 3). It gives off on its course the left common carotid and the left subclavian arteries from the summit of its curve.

Shortly before the origin of the left common carotid, midway between the two lobes of the thymus gland (removed in Fig. 3), the brachiocephalic or innominate artery runs forward and outwards from the root of the systemic towards the right side of the body. Slightly lateral to the thymus it splits into the right common carotid and subclavian arteries, as in other mammals. On the left, as has been mentioned, these take origin from the systemic arch itself. On each side the subclavian continues forwards and outwards, running, in the proximal part of its course, ventral to the pleural dome, and distally over the ventral face of the scalene muscle. In contact with the inner face of the first rib the subclavian divides into a brachial artery, passing to the flipper, and an internal mammary artery, passing backwards across the middle of the ribs along the inner face of the side wall of the thorax. This artery supplies, by means of its numerous branches, the more distal portions of the intercostal spaces. The brachial artery is very small in comparison with the subclavian and internal mammary arteries.

During its course beneath the pleural dome the subclavian artery gives off a stout branch—the posterior thoracic (Figs. 1, 3, 4 A), which runs round the anterior face of the pleural dome and backwards along the roof of the thoracic cavity underneath the pleuron; it is in contact with the ventral surfaces of the heads of the first five ribs, disappearing dorsally between the transverse processes of the 5th and 6th dorsal vertebrae. This artery forms a ridge at the extreme anterior face of the dome, causing a crescentic groove on the forepart of the lung where that organ presses against it. In its position and relations this posterior thoracic artery corresponds to a much enlarged superior intercostal artery, such as is found in other mammals.

The posterior thoracic artery is accompanied mesially by a stout complementary posterior thoracic vein which emerges from between the 7th and 8th dorsal transverse processes (Figs. 1, 3, 4 B). This vein passes rostrally with regard to the corresponding artery on the inner faces of the 1st and 2nd ribs, and is joined by the internal mammary vein. Blood returns from the flipper as a large brachial vein, which is joined by numerous plexiform veins from the ventral face of the scalene muscle between that muscle and the sterno-mastoid. This network forms an "axillary venous plexus" filling practically the whole of the space between these two muscles in the area of the axilla. It may,

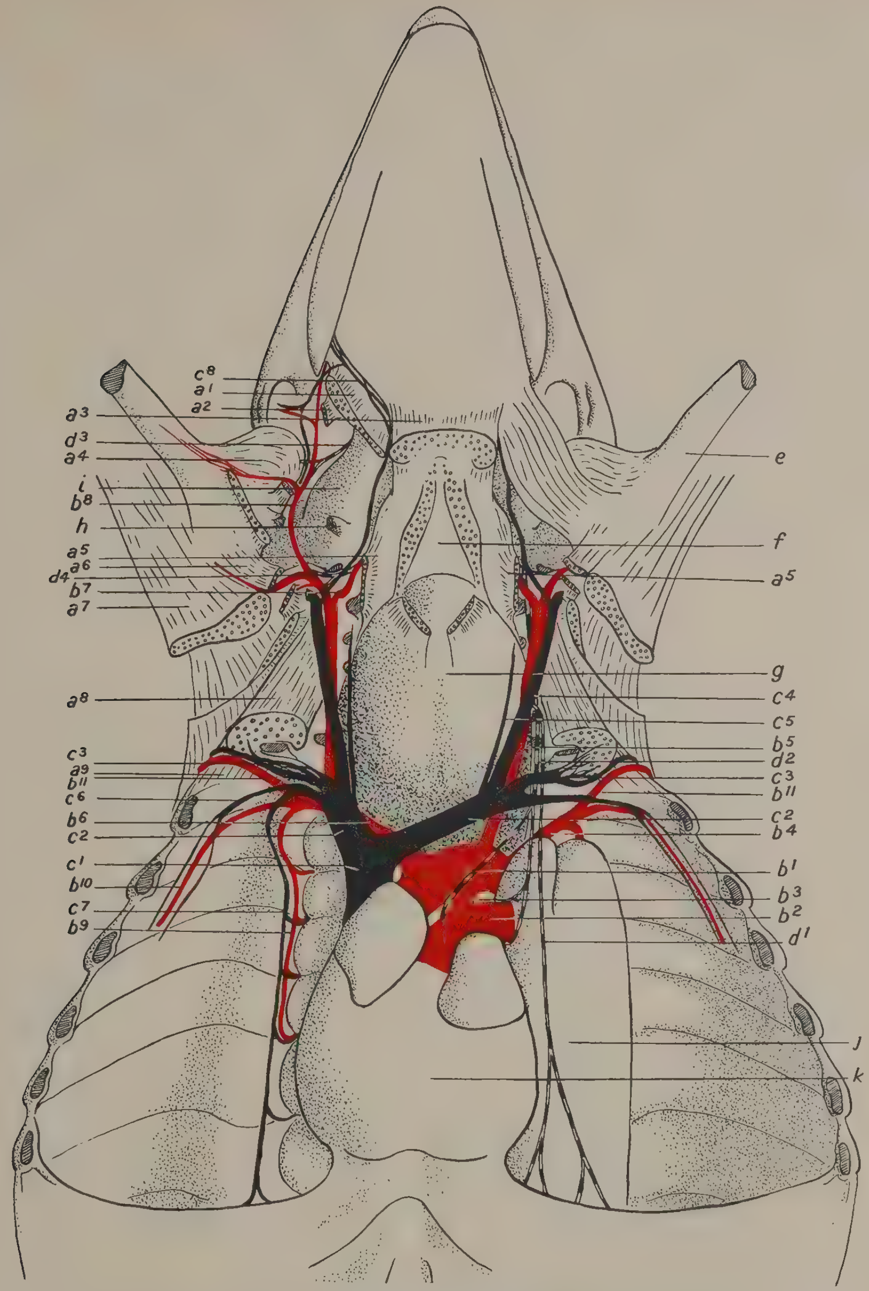


Fig. 3. The disposition of the main blood vessels in the neck region and the basis cranii. Thymus gland removed.

a^1, Internal pterygoid muscle
a^2, External pterygoid muscle
a^3, Palatoglossus muscle
a^4, Masseter muscle
a^5, Middle constrictor muscle of the pharynx
a^6, Depressor mandibulae muscle
a^7, Sterno-mandibularis muscle
a^8, Sterno-mastoid muscle
a^9, Scalene muscle
b^1, Dorsal aorta
b^2, Pulmonary artery
b^3, Ductus arteriosus
b^4, Left subclavian artery
b^5, Common carotid artery
b^6, Brachiocephalic artery
b^7, Internal carotid artery
b^8, External carotid artery
b^9, Posterior thoracic artery
b^{10}, Internal mammary artery
b^{11}, Brachial artery
c^1, Precava
c^2, Brachiocephalic vein
c^3, Brachial vein
c^4, External jugular vein
c^5, Internal jugular vein
c^6, Internal mammary vein
c^7, Posterior thoracic vein
c^8, Maxillary vein
d^1, Phrenic nerve
d^2, Pneumogastric nerve
d^3, Fifth nerve
d^4, Hypoglossal nerve
e, Mandible
f, Nasopharynx
g, Larynx
h, Meckel's cartilage
i, Tympanic bulla
j, Lung
k, Heart

indeed, be mentioned here that there is a general tendency, noted by most previous authors, towards a plexiform arrangement of all the venous channels of the body: the interstices of all the tissues all over the body of a Rorqual foetus are filled with these anastomosing venous channels. The brachial vein enters the brachiocephalic trunk by a short wide stem formed by the brachial, axillary plexus and internal mammary, and this may perhaps be considered to represent the subclavian vein.

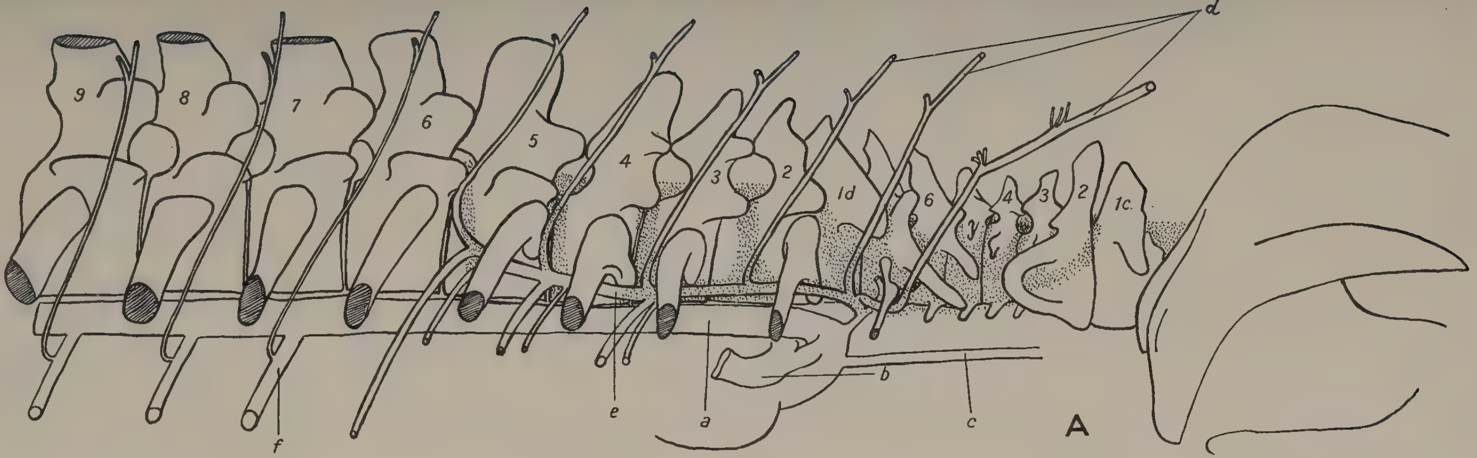
The two brachiocephalics join to form a wide precava entering the right auricle (Fig. 3).

The posterior thoracic artery and vein constitute the main trunks supplying and draining the great thoracic rete and the anterior intercostal areas.

Between the 5th and 6th rib (Fig. 4 A) the posterior thoracic artery turns dorsally, and running upwards and outwards, supplies by numerous twigs the longissimus dorsi and semispinalis muscles above the 5th dorsal vertebra. Between each pair of ribs anterior to this and in front of the 1st rib, which is cervical in its attachment, the posterior thoracic artery has a branch to the dorsal musculature similar to that between the 5th and 6th rib (Fig. 4 A). These are of increasing calibre as the series passes forwards and the first of them, which is directed more obliquely than those behind it, is a fairly stout trunk serving the muscles above the neck by numerous tufts of branches. The dorsal musculature behind the 6th rib is supplied by a series of very much smaller trunks arising from the segmental intercostal arteries of the dorsal aorta (Fig. 4 A). It is thus seen that the blood supply to the dorsal muscles becomes increasingly generous towards the anterior end of the body.

The posterior thoracic vein emerges from the neural canal behind the 7th dorsal vertebra. It passes downwards between the 7th and 8th ribs (Fig. 4 B), where it turns forwards, and after passing ventral to the head of the 6th rib, accompanies the posterior thoracic artery forwards to the anterior end of the thorax, where it has the relations already described.

A large thin-walled venous sinus accompanies the spinal cord latero-ventrally on either side within the neural canal of the vertebral column. Between the vertebrae, within the neural canal, the two venous sinuses on either side receive cross connections, so that there is a ladder-like system of large venous channels lying in the neural canal ventral to the spinal cord. These sinuses extend as far forward as the 7th cervical vertebra, where, on each side, they turn ventrally to form the first thoracic intraspinous vein of the series, shortly to be described, draining into the posterior thoracic vein. Anterior to that point, up to the foramen magnum, the neural canal is filled with a plexus, which is entirely venous, embracing the spinal chord and entering the skull through the foramen magnum to form a vascular mass against the hinder surface of the brain. Throughout the whole of their course in the neural canal these two large sinuses receive veins between the vertebrae entering the canal by the foramina between the neural spines (Fig. 4 B). Between the 7th and 8th dorsal vertebrae the vein traversing the foramen between the neural spines is the first of the series draining from the neural venous sinus into the posterior thoracic vein. It turns forward, as has been already stated, ventral to the 6th rib to form the posterior thoracic vein itself. Similar intra-



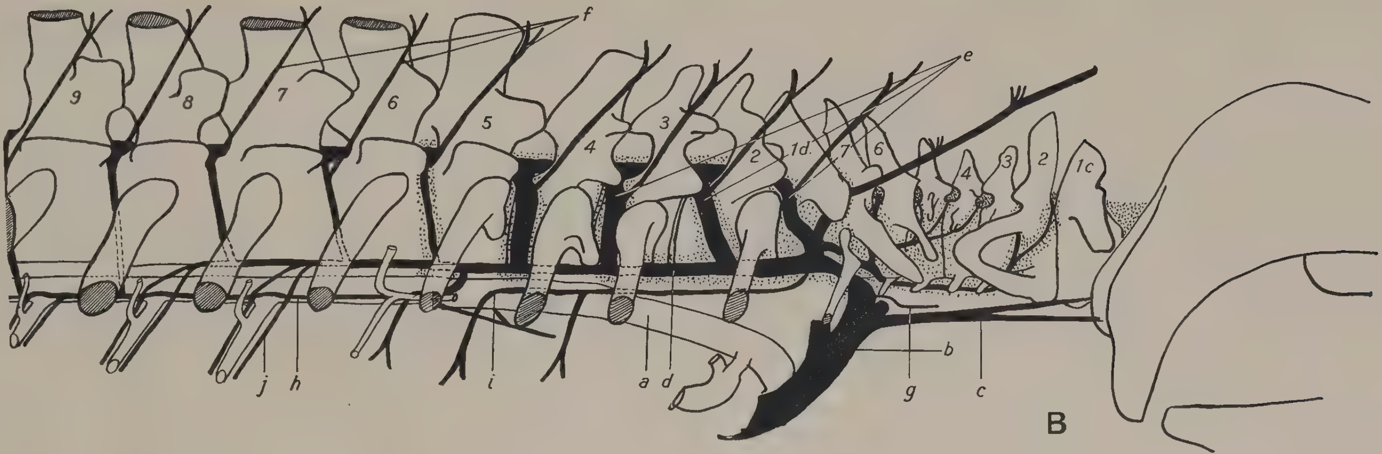


Fig. 4 A. The relation and disposition of the arteries at the anterior end of the thorax.

a, Dorsal aorta
b, Pulmonary artery
c, Common carotid artery
d, Ascending arteries
e, Posterior thoracic arteries
f, Segmental intercostal arteries

Fig. 4 B. The relation and disposition of the veins at the anterior end of the thorax. The descending veins and the intraspinous veins behind the 8th dorsal vertebra are in reality double. They have been drawn single for the sake of clearness. Rete dotted.

a, Dorsal aorta
b, Brachiocephalic vein
c, Jugular vein
d, Posterior thoracic vein
e, Intraspinous veins
f, Descending veins
g, Small anterior veins from Rete
h, Azygos vein
i, Posterior thoracic intercostals
j, Segmental intercostals entering the Azygos veins

spinous veins from the neural venous sinuses pass to the posterior thoracic between all the dorsal vertebrae up to the 7th cervical. Anterior to that, up to the 1st cervical, the intraspinous veins, of which there are six in the neck region, appear to take origin from the network of venous capillaries that fills the cervical portion of the neural canal. From the 8th dorsal vertebra to the 7th cervical vertebra there are thus eight veins connecting the neural venous sinuses and the posterior thoracic vein. They become increasingly stout forwards and the first four or five of the series are very wide indeed and have thin walls. Those between the 7th cervical and 1st dorsal and the 1st dorsal and 2nd dorsal join and enter the posterior thoracic by a common trunk between the 1st and 2nd rib. The intraspinous veins in the neck have the arrangement shown in Fig. 4 B. The vein emerging from between the 1st and 2nd cervical vertebrae passes through the large foramen in the transverse process of the 2nd cervical vertebra and is then joined by its successor to form a single vein running under the basal processes of the vertebrae in front of the 7th cervical. A stem from the 3rd and 4th, 4th and 5th and 5th and 6th meets it, and after receiving another from the 6th and 7th, it enters the posterior thoracic vein ventral to the head of the first rib in common with the first two thoracic intraspinous vessels (Fig. 4 B). Behind the 8th dorsal vertebra the thoracic intraspinous veins drain into a small independent trunk on each side of the vertebral column. These will be described when the intercostal blood supply is dealt with. In the abdomen the intraspinous veins connect the neural venous sinuses with the postcava and still further caudally with the caudal veins. These posterior connections will be referred to again, but it is desired to mention them here in order to point out that the neural venous sinuses must serve the purpose of reservoirs. They do not form part of the blood drainage back to the heart from any set of organs or from any region of the body. Anteriorly they are cut off from direct communication with the brain by vascular plexiform masses filling the neural canal. They are in direct and wide communication with the great veins of the body, and the blood would appear to flow in either direction in the connecting intraspinous vessels—that is upward in the abdominal region and downward in the thoracic region, or vice versa, without impeding the flow towards the heart. Thus in the Fin Whale they provide direct connection between the precaval and postcaval venous systems alternative to that provided by the heart.

Veins exactly complementary to the arteries ascending to the dorsal musculature join the intraspinous veins of the posterior thoracic system shortly after these leave the neural canal. Their course follows that of the arteries and they, likewise, increase in calibre forwards. Behind the 6th rib they drain into the segmental veins shortly to be described (Fig. 4 B).

The vascular masses of the rete mirabile are found surrounding the posterior thoracic artery as far back as the 4th dorsal vertebra and the roots of all the six arteries which ascend to the dorsal musculature from it. The masses of the rete lie between the transverse processes of the vertebrae and the heads of the ribs concerned. In the same way the rete surrounds the posterior thoracic vein and all the thoracic intraspinous veins except the last two. It also surrounds the intraspinous veins in the cervical region. It extends along them between the transverse processes and up into the neural canal, where it surrounds their junctions with the venous sinuses running in the canal. The intraspinous veins are thus embedded in the retial substance throughout their course from the neural canal to the posterior thoracic vein, but the ascending arteries pass out between the heads of the ribs considerably more laterally, and thus are only surrounded by retial substance at their roots, where they pass between the ribs.

These veins and arteries are in communication with the rete wherever they pass through it by means of innumerable small arterioles and venules and by somewhat stouter twigs. From many points on the main posterior thoracic trunks, also, small arteries and veins run to various parts of the rete, particularly around the proximal parts of the posterior thoracic vessels. The ascending arteries passing through the rete diminish somewhat in calibre after leaving it—that is dorsal to it. The intraspinous veins are correspondingly somewhat increased—that is ventral to the rete.

The retial masses are confluent above and below the heads of the ribs, forming a continuous enveloping mass as far as the 6th rib. However, in the 1·73 metre foetus the masses of retial substance surrounding the last two ascending arteries and the corresponding intraspinous veins were isolated from the main mass of the rete, and formed two lobes quite separate from the rest of the organ between the heads of the 4th and 5th and the 5th and 6th ribs. In the smaller foetus these two lobes seemed to be joined to the main body.

In the abdominal region each of the segmental ascending arteries, corresponding to those described above for the thoracic region, leaves the dorsal aorta as a single mid-dorsal trunk, which soon bifurcates, its branches passing to the dorsal musculature on either side of the vertebral column. The descending intraspinous veins from the neural venous sinuses drain into the postcava, as has already been mentioned. The postcava in the abdominal region consists of a pair of trunks, the venae iliacae (Daudt, p. 280), which run forward parallel with one another as far as the anterior end of the kidneys. Here they fuse to form a single median postcava, which has thus only a short course within the abdominal cavity before it penetrates the diaphragm. The venae iliacae on either side receive their intraspinous veins from the corresponding neural venous sinus of that side of the body. Farther caudally the ascending arteries are given off by the caudal artery and the intraspinous veins received by the caudal veins. Thus the neural venous sinuses are connected to the postcaval system throughout the whole length of the body and the precaval and postcaval venous systems are in open communication with one another by way of the neural canal.

The descending veins between the 6th and 12th lumbar vertebrae break up into a complicated venous network on the ventral aspect of the vertebral column as shown in Fig. 5. Presumably this network serves to facilitate the flow of blood from the postcava to the neural venous sinuses in the lumbar region of the body and in the opposite direction also.

The posterior thoracic system is not only responsible for the blood supply to the rete mirabile and the dorsal musculature, but it also serves the anterior intercostal

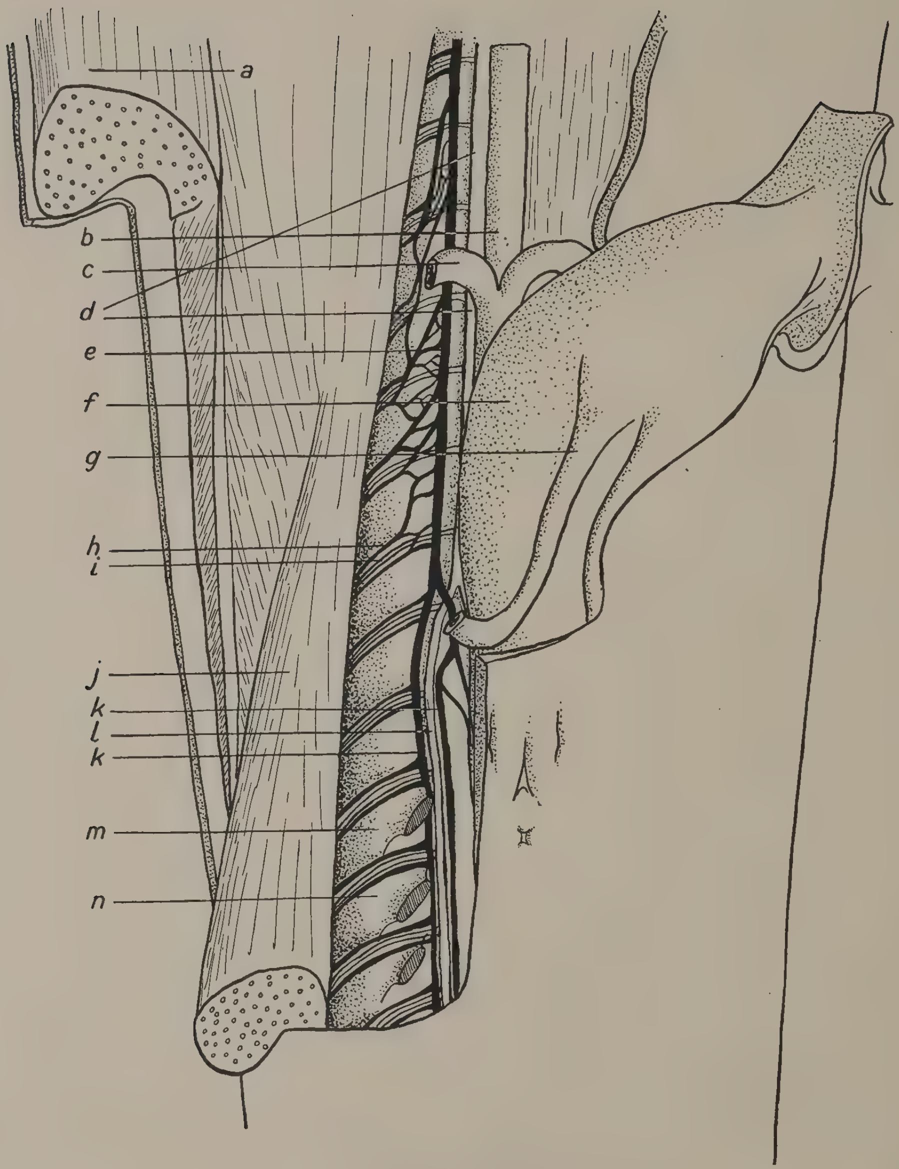


Fig. 5. The lumbar venous plexus.

a, Rectus abdominis muscle	*h*, Intraspinous vein
b, Rectum	*i*, Segmental ascending artery
c, Uterus	*j*, Hypaxial muscle
d, Dorsal aorta	*k*, Caudal vein
e, Right postcava	*l*, Caudal artery
f, Bladder	*m*, Fifteenth lumbar vertebra
g, Ureter	*n*, First caudal vertebra

spaces, as do the superior intercostal arteries and veins of other mammals. It will be convenient to give a brief description of the blood supply to the intercostal areas generally.

The middle and distal parts of the intercostal musculature are served by numerous branches of the internal mammary system. Mention has already been made of these and they need not be further described.

All the intercostal areas behind and including the 6th (that is, behind the 6th rib) are supplied from the dorsal aorta by means of segmental arteries (Figs. 4 A and 6). Each of these passes outwards, ventral to the intervertebral ligaments, and splits into an ascending branch to the dorsal musculature, serial with those coming off from the posterior thoracic, and a main intercostal branch to the intercostal muscles (Figs. 4 A and 6 *g*, *d*). In front of the 6th intercostal space the supply is derived not from the dorsal aorta but from the posterior thoracic artery (Fig. 6 *b*), which gives off a double series on each side. Each of the 3rd, 4th and 5th intercostal spaces is served by a branch from the posterior thoracic artery, serial with those from the aorta, and by a smaller branch serving their proximal parts. The 1st and 2nd intercostal spaces are not supplied with blood by means of arteries, either from the dorsal aorta or from the posterior thoracic, but are covered by the main body of the rete mirabile, which appears to be in intimate contact with the musculature underneath the pleuron. The 1st space is completely covered by the rete, and receives no branches from the internal mammary system, while the 2nd space is covered for about its proximal third and receives distally the first of the internal mammary series.

The intercostal venous return may broadly be said to be complementary to the arterial supply. The 8th space and all those behind it are drained by pairs of segmental veins. The 3rd, 4th and 5th drain into the posterior thoracic vein, while the 6th and 7th must be regarded as transitional since they contribute to both systems (Figs. 4 B and 6).

Behind the 7th space—that is in the 8th and all behind it—the intercostal veins and the descending intraspinous veins on each side drain into a small vein which runs ventral to the bodies of the vertebrae and arches over the segmental arteries at their origins from the aorta. These small veins run mesial to the ganglionated chords on each side. Just in front of the 6th dorsal vertebra the right member of this pair of venous trunks crosses the posterior insertion of the rectus capitis anticus muscle and joins the left-hand member of the pair at the level of the 3rd dorsal vertebra. The resulting single trunk enters the brachiocephalic vein above the root of the left lung (Fig. 6).

It has been stated by all authors that the azygos and hemiazygos veins of other mammals are absent or very much reduced in the Cetacea. Breschet and Bouvier were both of the opinion that the neural venous sinuses take the place of the azygos system. In the account given by the former author (pp. 18–19, pl. 4, fig. 1) the large descending intraspinous vein between the 3rd and 4th rib was described and figured on the left side only, while that on the right was omitted, so that the neural venous sinuses were stated by Breschet to present an azygous condition. Bouvier noted that the neural venous sinuses were not azygous, but nevertheless considered them analogous in function to the azygos vein. Owen (vol. III, p. 553) stated that in the Porpoise the

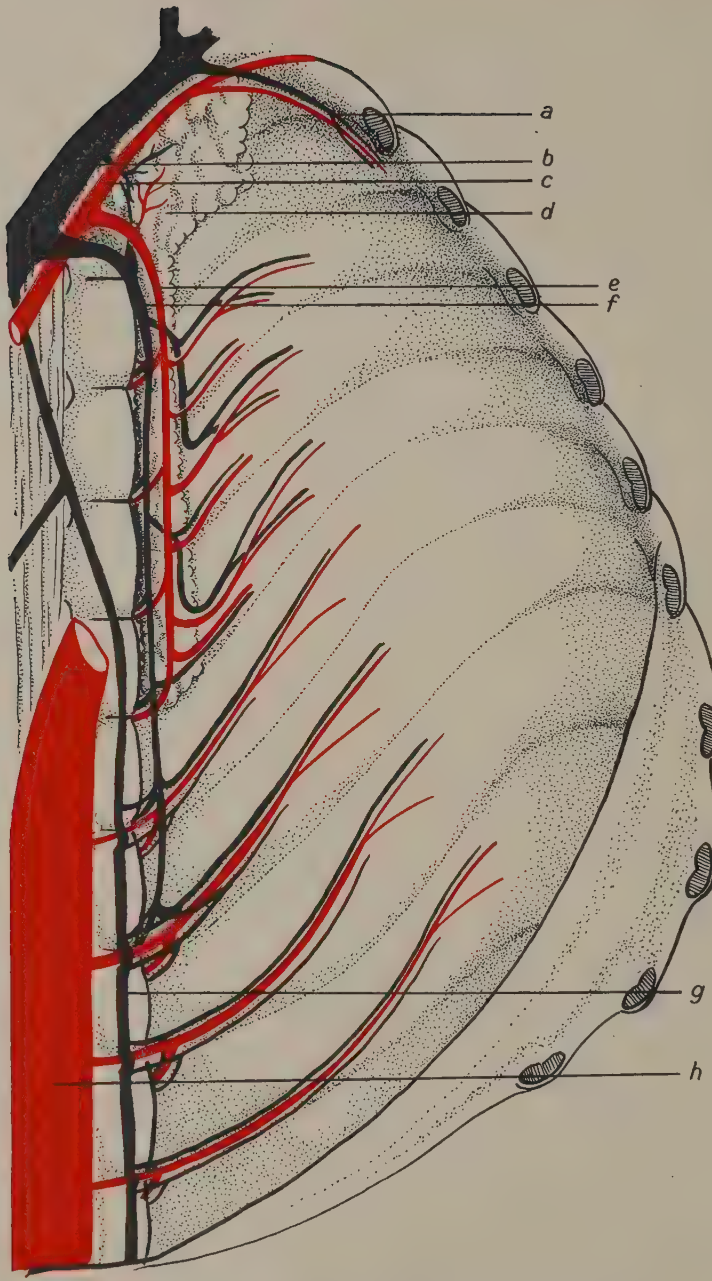


Fig. 6. Arrangement of the intercostal arteries and veins.

a, Internal mammary artery and veins	*e*, Left posterior thoracic artery
b, Left brachio-cephalic vein	*f*, Left posterior thoracic vein
c, Left subclavian artery	*g*, Left azygos vein
d, Rete mirabile	*h*, Dorsal aorta

definition of any distinct azygos or hemiazygos trunk is obscured by the characteristic expansion and plexiform multiplication of the veins at the back of the thoracic cavity. Schulte (p. 467) quotes von Baer as stating that the azygos is missing altogether in the Porpoise, while in the Sei Whale Schulte (pp. 467–8) describes it as present rudimentarily. He mentioned a small venous trunk having a zig-zag course above the ganglionated chord on the right side, receiving laterally branches from the right intercostal spaces and mesially branches from the left intercostals. Possibly the small vessel described by Schulte corresponds to the right-hand member of the pair found by me.

It is suggested that this pair of small veins and the single trunk by which it joins the left brachiocephalic are the homologues of the azygos veins. There is considerable variation in the disposition of the azygos throughout the Mammalia (Owen, vol. III, p. 555). Among the Marsupials both azygos veins are present in the primitive Saurian post-cardinal position. In the Ungulates there is a single (right) azygos entering the single (right) precava. In the Hog the single left azygos enters the right auricle directly. In the Antelope two azygos veins are present—the left being the larger (Owen, quoting Hunter, vol. III, p. 555). In the Rhinoceros the right precava receives the right azygos vein while the left drains into the left subclavian. That the azygos of the Fin Whale, then, should lie on the left and enter the left brachiocephalic (innominate of other mammals) is not an unusual feature.

It may be said, therefore, that the descending intraspinous veins (Figs. 4 B and 6) and the intercostal veins of the 6th space and all those behind it enter the azygos venous system. They are complementary to the corresponding ascending and intercostal arteries which are derived from the dorsal aorta.

In the 7th intercostal space, however, the main intercostal vein joins the posterior thoracic as well as the azygos, to which small cross connections also run (Figs. 4 B and 6). This is also observed in the 6th space, so that these two spaces would appear to be transitional between the segmental and posterior thoracic intercostal systems.

In the 5th space veins exactly complementary to the arteries drain into the posterior thoracic. In the 4th and 3rd spaces the intercostal veins also empty into the posterior thoracic system, but may show slight variations. For example, in the larger foetus the veins from these two spaces on the left side joined together to form a common trunk before reaching the posterior thoracic. In the smaller foetus they passed straight into that vein on both sides of the body.

The 1st and 2nd spaces are, as already stated, covered by the rete.

From the above description and from the figures it will be seen that the intercostal blood supply is derived from four sources:

(i) The internal mammary, supplying the middle and distal parts of all the spaces except the first.

(ii) The segmental system, supplying the 6th space and all behind it.

(iii) The posterior thoracic system, supplying the 3rd–5th space.

(iv) The rete mirabile, which overlies the whole of the 1st and the proximal part of the 2nd space.

It may be observed also that there is an increasingly generous blood supply to the intercostal muscles proceeding forwards. The branches from the posterior thoracic are bi-seriate (Fig. 6), and tend to be of larger calibre rostrally than posteriorly. The posterior thoracic arteries and veins correspond to a much enlarged and accentuated superior intercostal system, such as is found in other mammals. By their contact with the rete mirabile the first two intercostal spaces are probably the most generously supplied with blood of the whole series.

RELATION TO NERVES

The pneumo-gastric nerve (Fig. 3 d^2 and Fig. 7 *f*) accompanies the carotid artery and the jugular vein, passing above the short subclavian vein and under the subclavian artery to its destination in the roots of the lungs and heart.

The phrenic (Fig. 3 d^1 and Fig. 7 *l*) is derived from the 4th cervical spinal nerve, and accompanies the pneumo-gastric as far as the great vessels, where it diverges and crosses the body of the lung to the diaphragm.

The 5th, 6th, 7th and 8th cervical spinal and the 1st thoracic spinal nerves (Fig. 7 cr^{5-8}, tr^1) contribute to the cervico-brachial plexus, passing through a slit in the scalene muscle to reach it.

The cervical sympathetic chord (Fig. 7 *g*) accompanies the pneumo-gastric as far as the 7th cervical vertebra, where it passes outwards and somewhat upwards into the

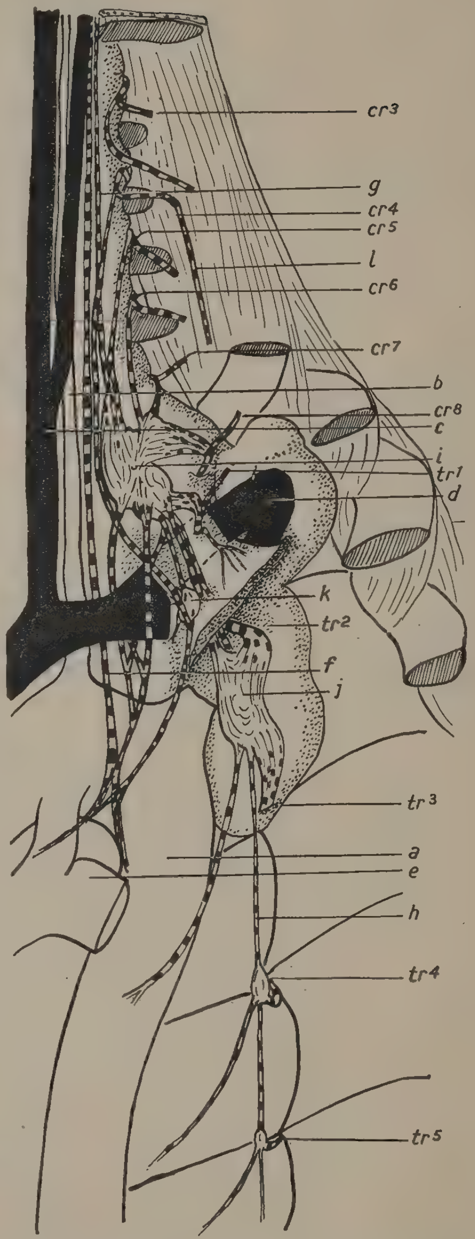


Fig. 7. Nervous relations of the thoracic rete. The rete is dotted. Part of the posterior thoracic vein has been omitted in order to show the nerves underneath.

a, Dorsal aorta
b, Carotid artery
c, Jugular vein
d, Posterior thoracic vein
e, Pulmonary artery
f, Pneumo-gastric nerve
g, Cervical sympathetic chord
h, Thoracic sympathetic chord
i, Middle cervical sympathetic ganglion
j, Posterior cervical sympathetic ganglion
k, Retial ganglion
l, Phrenic nerve
cr^{3-8}, Cervical spinal nerves
tr^{1-5}, Thoracic spinal nerves

body of the rete. In the middle of the retial mass it forms the middle sympathetic ganglion (Fig. 7 *i*)—a large stellate ganglion lying opposite the 1st rib. Small sympathetic nerves run from it into the body of the rete. The middle cervical sympathetic ganglion receives rami from the 5th, 6th, 7th and 8th cervical and the 1st thoracic spinal roots—all those which form the cervico-brachial plexus. From the hinder part of the ganglion there is given off a bundle of nerves forming a plexus whose components run above and below the posterior thoracic vein (Fig. 7). On emerging from the body of the rete they join up to form a pair of nerves passing to the heart and lungs. One of these has a ganglion on its course—the retial ganglion (Fig. 7)—and receives a long ramus from the 4th cervical spinal, from which the phrenic is also derived. The retial ganglion lies a little behind and dorsal to the posterior thoracic vein and also gives off nerves into the substance of the rete. Nerves also run into the rete directly from the cervical and thoracic spinal roots—the most conspicuous being a stout retial nerve from the 1st thoracic, which ramifies among the retial capillaries in the neighbourhood of the posterior thoracic vein.

The posterior cervical sympathetic ganglion lies more dorsally within the retial substance, close up against the heads of the 3rd and 4th ribs (Fig. 7 *j*). It is connected with the middle ganglion by two stout chords: these have cross connections and really form a short plexus. The posterior ganglion receives rami from the 2nd and 3rd thoracic spinal nerves, and gives off yet a third sympathetic nerve to the heart and lungs, running across the distal part of the aortic arch to reach its destination. The main thoracic ganglionated chord leaves the posterior cervical ganglion and runs as usual across the heads of the ribs forming segmental ganglia, each of which has the usual rami running to the spinal roots. The 1st of these segmental ganglia lies between the heads of the 4th and 5th ribs (Fig. 7).

In the larger foetus there appeared to be communication within the rete between all the spinal nerves contributing to the two sympathetic ganglia, and fibres could be seen running from these spinal branches to the three sympathetic nerves to the heart and lungs. The two sympathetic ganglia were very closely invested by the retial substance, which formed a compact mass around them.

From the above it appears that the rete is mainly under the control of the sympathetic system, while to some extent it is evidently under the control of the somatic as well.

SUMMARY

The thoracic rete is a network of vascular capillaries situated around the anterior extremity of the thoracic cavity, in the fork formed by the convergence of the rectus capitis anticus major and the scalene muscles passing to their joint insertion upon the basis cranii. The rete is independent of surrounding structures, but in close contact with the muscles of the first two intercostal spaces.

The vascular networks extend along the vertebral column and between the heads of the ribs from the 1st cervical to the 6th dorsal vertebra. They pass up between the transverse processes into the neural canal.

Two large thin-walled venous sinuses accompany the spinal chord as far forward as the 7th cervical vertebra. Anterior to this the canal is filled with a venous plexus extending into the skull through the foramen magnum and embracing the back of the brain.

From the neural venous sinuses intervertebral (descending intraspinous) veins descend throughout the whole length of the body. In the neck region they are found also collecting themselves from the venous plexuses in the neural canal. As far back as the 8th dorsal vertebra the intraspinous veins join the posterior thoracic. Posterior to the 8th dorsal vertebra they join the small azygos veins which have been shown to exist. In the abdominal region they drain into the postcava.

The precaval and postcaval venous systems are thus in free communication with one another through the neural canal, and blood reaches the heart from the neural venous sinuses in whichever direction it flows in them. Appearances suggest that these sinuses are blood reservoirs.

The rete surrounds all the descending intraspinous veins back to the 6th dorsal vertebra. It surrounds them throughout the whole of their course and is in free communication with them by means of numerous subsidiary twigs. The rete surrounds the posterior thoracic vein and artery in the proximal parts of their course and also the roots of the arteries ascending to the dorsal musculature from the posterior thoracic.

The rete is everywhere in free communication with the vessels it surrounds, whether arteries or veins. It does not, however, block the course of any of them. This is opposed to the earlier conceptions of the retia, according to which these networks were supposed to be formed on the course of either an artery or a vein. The foregoing description shows that they must be looked upon as capillary systems intervening between arteries and veins.

The rete is in intimate contact with the muscles of the 1st and 2nd intercostal spaces. The blood supply to the intercostal muscles becomes increasingly generous proceeding forwards.

The rete is mainly under the control of the sympathetic nervous system but to some extent of the somatic as well.

THE BASICRANIAL RETE

The cavity between the tympanic bulla and the articulation of the mandible is occupied by a vascular network similar in appearance to the thoracic rete already described, i.e. consisting of intimately related arteries and veins.

RELATION TO SKULL

The shape of the skull and the form of the basis cranii are extremely different in foetus and adult. The position and relations of the basicranial rete were only examined in detail in the foetus. From a general inspection of the adult basis cranii, however, it seems that the rete holds the same relations to the surrounding parts in the adult as in the foetus, but in consequence of the change in size and shape of those parts the form and relative size of the rete has undergone considerable alteration.

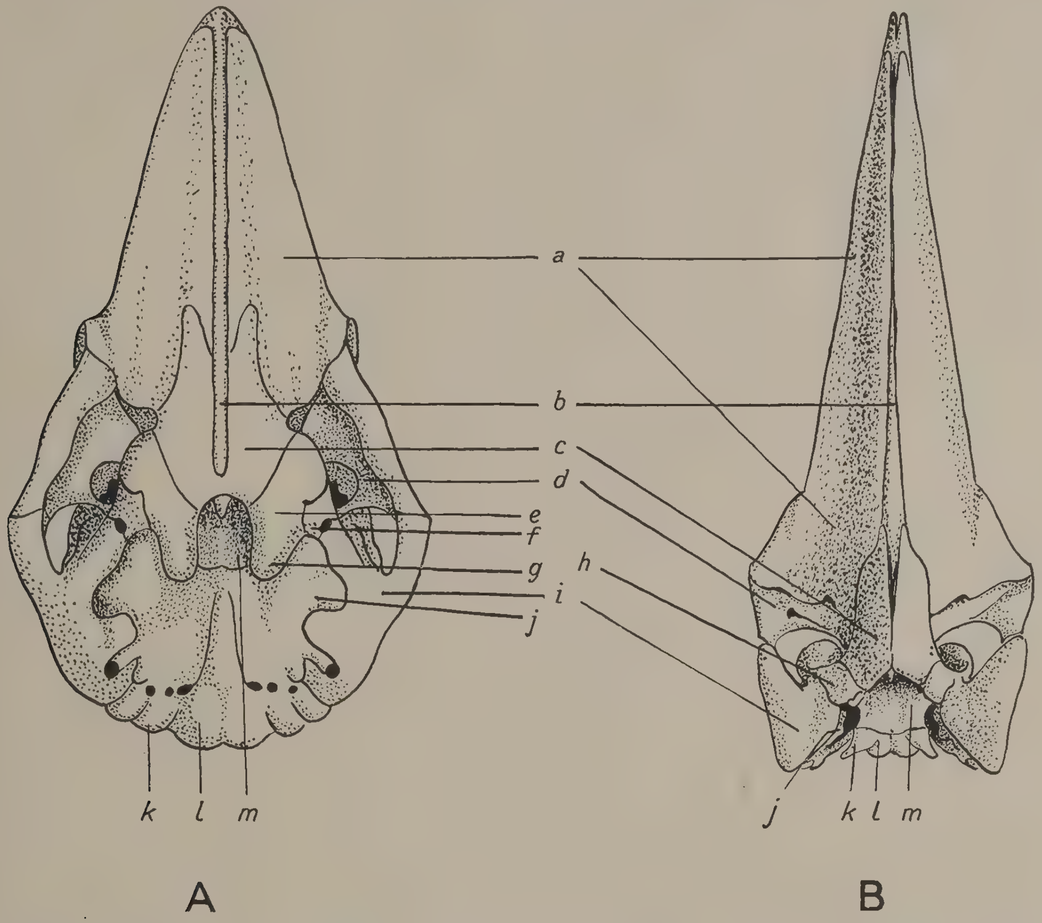


Fig. 8. *A*. Skull of a foetal Sei Whale, ventral view (from Schulte). *B*. Skull of an adult Sei Whale, ventral view.

Showing the difference in the arrangement of the parts of the basis cranii in the foetus and adult.

a, Maxilla
b, Vomer
c, Palatine
d, Frontal
e, Internal pterygoid plate
f, External pterygoid plate
g, Hamular process
h, Pterygoid bone
i, Squamosal
j, Tympanic
k, Exoccipital
l, Basi-occipital
m, Basi-sphenoid

The chief differences between the foetal and adult cranium (Fig. 8) are to be seen in the short broad rostrum and the flat palate of the foetus, which contrast very markedly with the prominent raised palatal ridge and the elongated pointed rostrum of the adult. The rostrum is formed in the adult by the enormously lengthened maxillae embracing the vomer between them. The foetal brain case is of great size and domed, while the lateral projections of the frontals and squamosals are very small in comparison with those of the adult, where the squamosals form two large postero-lateral downwardly curved wings.

The base line of the foetal skull is horizontal and the whole plane of the basis cranii broad and flat, while in the adult it curves strongly downwards from the great wing-like projections of the maxillae. The foetal maxillae are of comparatively small size, while the palatines and pterygoids are large, the latter projecting backwards on either side of the posterior nares to form two rounded bosses—the hamular processes (Fig. 8). Schulte (1916, pp. 476–7; pl. 54, fig. 2; pl. 55, fig. 2) distinguished two parts of the pterygoid bone of the foetal Sei Whale, an internal and an external pterygoid respectively, separated by a suture. Ridewood (1922, pp. 263–4), however, did not confirm the presence of this suture in the skull of the Sei Whale foetus examined by him, nor in the skulls of foetal *Megaptera nodosa*. This author believed that the pterygoid bones figured by Schulte are in reality parts of the palatine.

While the predominating features of the adult basis cranii are the laterally projecting squamosals and the large wing-like maxillae, the predominating feature in the foetus is the enormous tympanic bulla with its tube-like meatus. It is joined to the mandible by a slender strip of cartilage—Meckel's cartilage—enclosed in a fibrous sheath. In the adult the bulla is a relatively very small fist-shaped bone concealed on the inner side of the squamosal wing. It forms a quite insignificant feature of the occipital region.

In the foetus the basicranial rete lies on the ventral surface of the squamosal bone, in a cavity between the enormous round dome of the tympanic bulla and the articulation of the mandible. It extends over the external pterygoid plate and the alae temporales into the orbit. It thus occupies a large crescent-shaped space in the foetus. In the adult, however, the dimensions of this space are much reduced owing to the shrinkage of the bulla and the pterygoid and the development of the fibrous articulation of the mandible which occupies most of the squamosal wing. So far as could be made out the greatest extension of the adult rete is vertical, so that it forms a fatty vascular mass, similar in appearance to the thoracic rete, extending upwards into the fissure between the squamosal and the basioccipital bones, where lies the small fist-like tympanic. It appears also to extend on to the pterygoid in the adult, but this part is concealed by the broad internal pterygoid muscle.

RELATION TO MUSCLES

The cavity occupied by the rete in the foetus thus extends from the orbit to the extreme posterior limit of the tympanic bulla (Fig. 9). It underlies the tympanic ventrally, and is laterally bounded by the masseter muscle and the attachment of the pterygoid muscles to the mandible. The broad sheet-like internal pterygoid muscle forms the floor of the space, and the mesial boundary of it is made up of the palato-glossus muscle and the middle constrictor of the naso-pharynx. The palato-glossus has a broad fibro-muscular attachment to the palate and to the hamular processes at the root of the tongue. It thus separates the rete and the cavity it occupies from the posterior nares. Immediately posterior to the nares is a large cavity with fibro-muscular walls—the naso-pharynx—in the formation of which the palato-glossus muscle takes a large part. The naso-pharynx contains the larynx and associated structures. Two great constrictor muscles, of which the largest is the middle constrictor, run from the wall of the naso-pharynx to the stylo-hyoid cartilage. Both this cartilage and the middle constrictor muscle are shown cut through in Fig. 9. In the posterior half of the rete the middle constrictor muscle forms its mesial boundary. Anteriorly the mesial boundary is formed by the palato-glossus as already mentioned. The middle constrictor also forms a large part of the posterior boundary of the rete.

There is thus a space, bounded by the squamosal bone and the tympanic bulla dorsally, by the mandible and the masseter and pterygoid muscles laterally, by the belly of the internal pterygoid muscle ventrally and by the palato-glossus and middle constrictor mesially and posteriorly. Here the rete is found, forming a large crescent-shaped highly vascular mass, exactly similar in appearance to the thoracic rete already described. It resembles the latter in that it is invested in its own fibrous integument, and is easily dissected away from neighbouring cartilages and muscles, with which it appears to have no intimate relation. The thoracic rete, however, is very much more diffuse. The basicranial rete completely surrounds and envelops the external pterygoid muscle, which runs through the midst of it from the external pterygoid plate of Schulte (Fig. 9) to its attachment to the mandible. It also surrounds Meckel's cartilage, which forms a narrow cartilaginous rod within a fibrous sheath running from the bulla to the mandible across the space occupied by the rete.

RELATION TO BLOOD VESSELS

Like the thoracic rete the basicranial rete is composed of intimately related arteries and veins. The external carotid artery, cervico-facial of Turner, which passes from the common carotid along the lateral part of the face towards the orbit and maxilla, traverses the centre of the basicranial rete dorsal to Meckel's cartilage (Figs. 3 and 9). During its course through the rete it repeatedly gives off short many-branched arteries to the retial substance. A branch runs to the lower jaw from the cervico-facial shortly before that artery reaches the rete. Opposite the orbit the cervico-facial splits into an orbital and a maxillary branch. A vein, the pterygo-maxillary, runs from the palatine border of the maxilla diagonally across the attachment of the internal pterygoid muscle to the palate. It passes external to the hamular process, and runs closely adherent to the fibro-muscular wall of the pharynx, around the inner and posterior surface of the tympanic bulla, to join the jugular vein. Its course over the attachment of the internal pterygoid muscle is plexiform, and it receives a network of veins at this point from the mesial and ventral parts of the rete. The main body of the rete is drained by a pair of veins having a rostral direction and joining up with the orbital vein to enter the pterygo-maxillary behind the orbit. From the mandible a plexus of small veins breaks up among the capillaries of the rete.

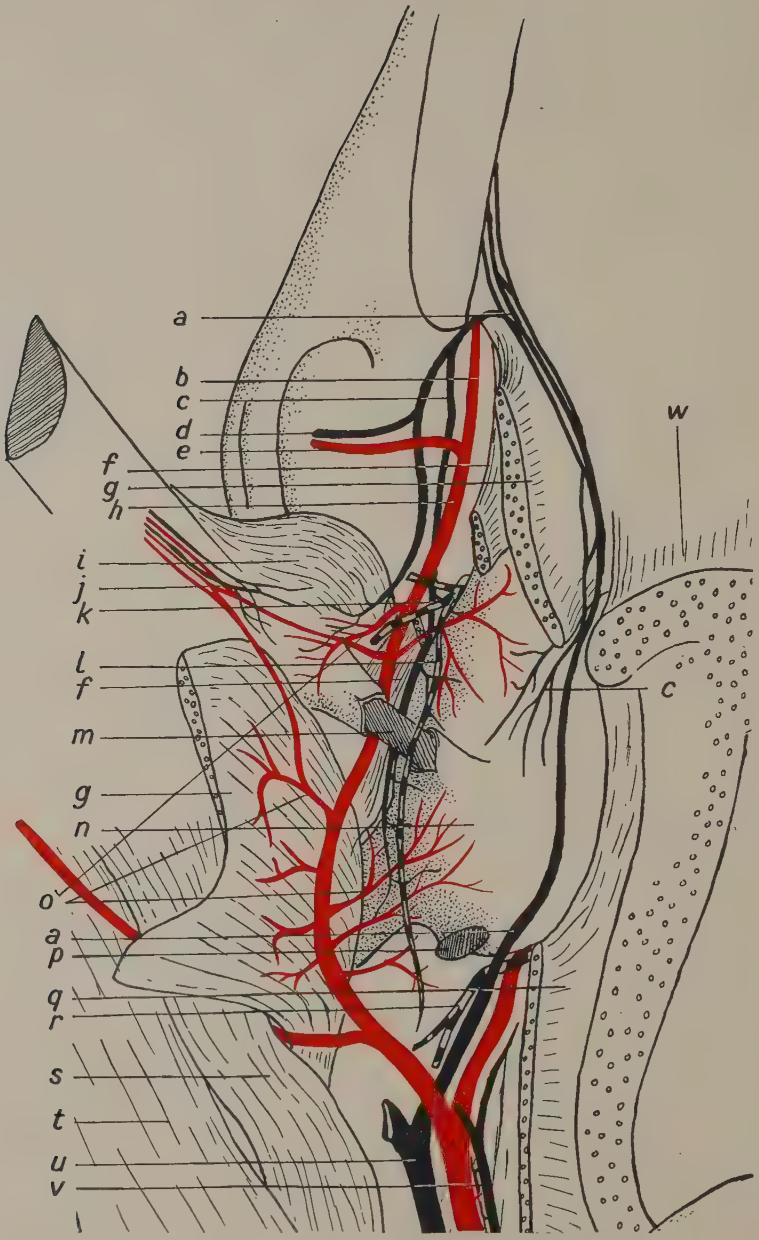


Fig. 9. Position and relations of the basicranial rete.

a, Maxillary vein
b, Maxillary artery
c, Retial veins
d, Orbital vein
e, Orbital artery
f, External pterygoid muscle
g, Internal pterygoid muscle
h, External carotid artery
i, Masseter muscle
j, Plexiform arteries and veins from the mandible
k, Fifth nerve
l, Retial nerve
m, Meckel's cartilage
n, Tympanic bulla
o, Retial arteries
p, Stylo-hyoid cartilage
q, Middle constrictor muscle of the pharynx
r, Hypoglossal nerve
s, Depressor mandibulae muscle
t, Sterno-mandibularis muscle
u, External jugular vein
v, Internal jugular vein
w, Palato-glossus muscle

It may be mentioned that a slender vascular plexus lies between the distal parts of the common carotid artery and the internal jugular vein, close to the origin of the pterygo-maxillary and internal carotid arteries. This rete drains into the internal jugular vein. There is indeed a high degree of vascularity in all the tissues around the base of the skull and the cranial part of the neck region. The general tendency of the venous channels in the Fin Whale to a plexiform disposition has already been noticed, and has been observed in Cetacea by other authors (Owen, for the Porpoise).

RELATION TO NERVES

Among the vascular networks of the basicranial rete there is a complex of fine nerves taking origin from the trigeminal. A special retial branch leaves the fifth nerve at its point of emergence from the cranium immediately in front of the tympanic bulla and passes in a caudal direction (Fig. 9), ventral to Meckel's cartilage, distributing nerves to the surrounding vascular capillaries. Further branches to the rete leave the fifth nerve before its emergence from the skull and accompany it through the fenestra.

SUMMARY

The basicranial rete lies at the base of the skull in a cavity between the articulation of the mandible and the tympanic bulla. It is bounded by the internal pterygoid, palato-glossus and middle constrictor muscles.

It receives numerous fairly stout branches from the external carotid artery, cervico-facial of Turner, and drains into the pterygo-maxillary vein.

It is innervated from the trigeminal nerve.

One of the chief features of the basicranial rete is its separateness from surrounding structures. It is invested by a connective tissue integument, and can be dissected away from surrounding muscles. Like the thoracic rete, however, it possesses its own arteries, veins and nerves, and does not lie upon the direct course of any main blood vessel. It is, indeed, even more discrete and compact than the thoracic rete, and the vessels that supply it are distinct and separate vessels to an extent even more marked than in the thoracic rete. Judging from the disposition of the arterial supply and venous drainage, it may be suggested that the blood which enters the rete is entirely arterial and the rete, unlike the thoracic one, is an entirely arterial structure. The thoracic rete, as already indicated, is partly arterial, but from its arrangement would appear to be to a larger extent venous. Blood must be supposed to enter the basicranial rete from the cervico-facial artery and to leave it by subsidiary veins draining into the pterygo-maxillary vein.

THE INGUINAL PLEXUS

A large vascular network is situated in the inguinal region and appears to be intimately related to the inguinal lymphatic glands. It is not proposed to employ the term "Rete Mirabile" for this plexus, since its appearances suggest a difference in nature from the basicranial and thoracic retia described above. The plexus takes the form of a diffuse vascular mass situated on either side of the bulbus penis in the male (Fig. 10) or of the vagina in the female. It lies between the bulbus or vagina and the posterior insertions of the rectus abdominis muscle. It is intimately related to the two very large lymph glands which are situated in this position and are presumably the homologues of the inguinal lymph glands of other mammals. On each side of the body one of these lymph glands (Fig. 10) lies against the prostatic portion of the urino-genital

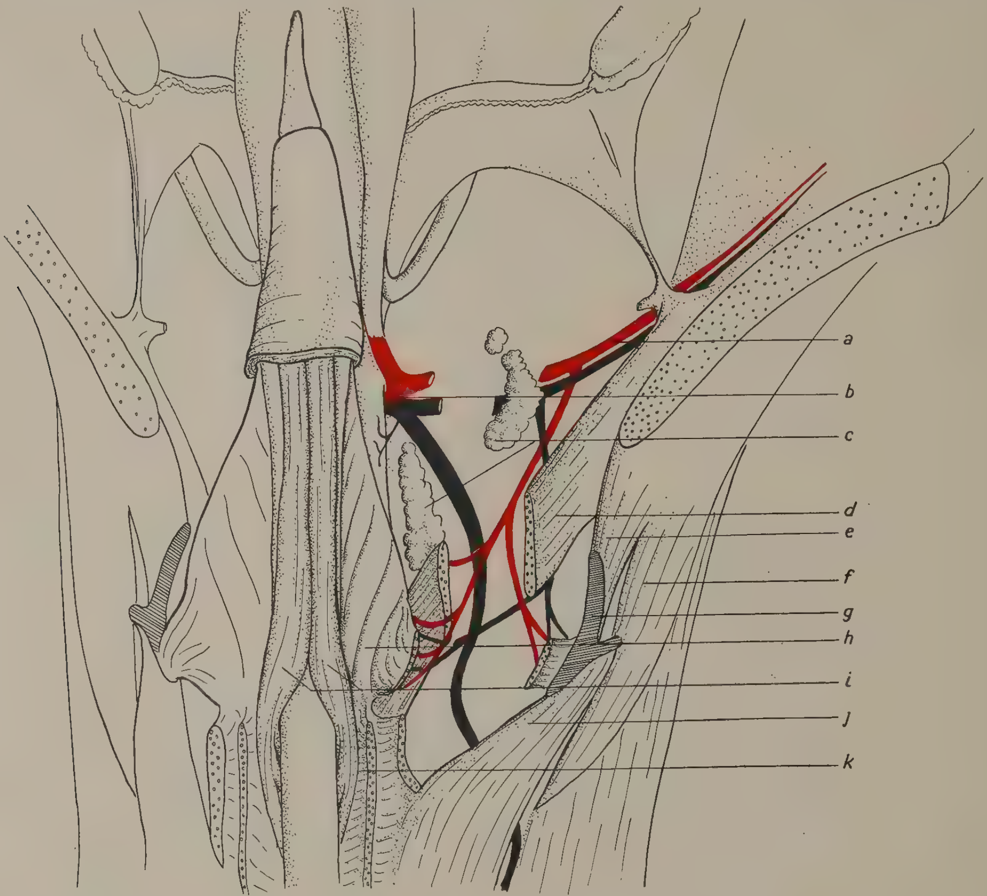


Fig. 10. The genital region of a foetus 1·77 metres in length showing the three arcades formed by the attachments of the rectus abdominis muscle and the vessels concerned in the formation of the inguinal plexus.

a, Epigastric artery
b, Iliac artery
c, Inguinal lymphatic glands
d, Caudal attachment of the rectus abdominis muscle
e, Iliac attachment of the rectus abdominis muscle
f, Superficial attachment of the rectus abdominis muscle
g, Pelvic rudiment
h, Ischio-cavernosus muscle
i, Retractor penis muscle
j, Ischio-caudalis muscle
k, Levator ani muscle

duct or the lower part of the vaginal canal. The other overlies the epigastric artery and vein where they pass together from the iliacs on to the parietes of the abdominal cavity. The glands are surrounded by dense concentrations of vascular substance (especially the one lying against the prostate or vagina), which peripherally spread out in a diffuse manner among the surrounding blood vessels and muscles.

A similar diffuse network extends up the middle line of the body in close relation to the lymph tract occupying that area. Although the disposition of the lymph tracts all over the body was not studied and does not form the subject of the present paper, it may be mentioned that vascular plexuses, similar to this one in the inguinal region, are found wherever there is a concentration of lymphatics. These plexuses are diffuse and ill-defined, and evidently different in nature, and thus probably in function, from the two great retia in the thorax and basis cranii. The plexus in the inguinal region, however, is so large and dense, and occupies such an extensive area, that some description of its relations is justified.

The rectus abdominis muscle has a threefold posterior attachment. An inner portion, described by Carte and Macalister (pp. 223–4), narrows to a tendinous attachment to the anterior chevron bones. A central slip is attached to the ilium of the rudimentary pelvis. A third and outermost slip has a triangular insertion upon the lumbar fascia between the ischio-caudalis and hypaxial muscles, immediately lateral to the bulbus penis or to the vulva. There are thus two muscular arcades on each side of the genital region admitting nerves and blood vessels. The outer arcade is formed by the insertion of the rectus abdominis into the lumbar fascia on one side and the ilium on the other. This arcade admits a stout vein from the superficial fascia of the pedicle. This has plexiform anastomoses with the iliac veins. A stout lumbar nerve accompanies this vein, but there is no complementary artery. The inner arcade is formed by the iliac insertion of the rectus abdominis and the part passing to the chevron bones. It admits the pudic arteries and veins with their accompanying nerves. These vessels, together with the lumbar veins just mentioned and the epigastric arteries and veins, contribute to the formation of the plexus around the two lymph glands. The plexus is continued rostrally towards the two kidneys on either side of the middle line of the body beneath the peritoneum, where it is in close association with the lymph glands which occupy that tract. It receives small arteries from the aorta in this region and is drained by small veins to the two large iliac branches of the postcava. In the region of the inguinal plexus there are numerous sympathetic nerves, connected with the hypogastric nerve plexus, and the stout somatic nerves to the genital region run through the inner arcade of the rectus muscle on to the penis and clitoris. It did not appear, however, that the vascular plexus was innervated by any of these, although they run through the midst of it. The plexus can be dissected away from around them along their whole course, and no small nervous twigs were found running to the plexus, such as were seen in the thoracic and basicranial retia.

SUMMARY

It seems that the plexus in the inguinal region is different in nature and function from the others described in this paper. It is in intimate relation with the lymph glands and their channels and has no innervation that could be detected in dissection. It is far more diffuse in texture than the thoracic and basicranial Retia and has not the connective tissue investment that was found in the latter.

Murie (1873, pp. 290–1) has noted the close association of lymphatics and vascular networks, and it may be that, as he has suggested, these networks afford interchange between the blood and the lymphatic systems.

DISCUSSION

The following facts have emerged from the foregoing description of the retia mirabilia and their relations.

1. The retia are vascular masses closely investing certain arteries and veins, but not forming an integral part of them. They do not impede the flow of blood in any direction either away from or towards the heart. They are supplied with blood by their own arteries and drained by their own veins. Thus they are independent organs, and not merely constrictor mechanisms on the course of the main blood-system. It is therefore incorrect to describe them as either arterial or venous. The blood, however, which enters the thoracic rete must be mainly venous, entering it from the neural venous sinuses. A smaller proportion will be arterial, entering the rete from the posterior thoracic artery. The blood which enters the basicranial rete must be supposed to be mainly arterial, derived from the main facial artery.

2. The precaval and postcaval venous systems are in open communication by way of the neural venous sinuses and the lumbar venous plexus. The two wide sinuses accompanying the spinal chord would appear to have the function of reservoirs, since they do not drain any organ or region of the body, but receive blood from the main venous channels of the body. In whichever direction the blood flows in the sinuses it reaches the heart.

3. There is an increasingly generous blood supply to the intercostal muscles proceeding forwards. The two anterior pairs of intercostal spaces have no direct arterial supply or venous drainage, but are in close contact with the capillaries of the thoracic rete.

4. The thoracic rete is innervated by the somatic and sympathetic nervous systems and the basicranial apparently by the trigeminal nerve only.

The function of the retia would seem to be the retention of blood. They are blood reservoirs but they do not interfere with the blood supply to or from any part. That the retia were reservoirs of this sort was the suggestion of Hunter (1787, pp. 371–459), Breschet (1836, pp. 1–82) and Owen (1868, vol. III, pp. 545–6). These authors believed, however, that the structures are used for the distribution of arterial blood to the general circulation during periods when ordinary respiration is suspended, and that the blood so distributed acts in lieu of freshly oxygenated blood from the lungs. The blood from the retia, however, does not, as has been seen, empty into the general arterial circulation, but immediately into the venous system, whence it returns to the heart by way of the posterior thoracic vein or neural sinuses from the thoracic rete, and by way of the jugular vein from the basicranial rete. Further, the blood in the thoracic rete at any rate is more venous than arterial.

Turner (1872, p. 233) suggested that the rete serves for the retention of blood on its course to certain delicate organs, such as the brain and spinal cord, thus equalizing and distributing the blood stream to these organs and preventing their engorgement. Such an apparatus is seen in the intracranial arteries of ruminants and in the arteries of the human pia mater. However, the arteries which lead through the rete do not serve the brain or spinal chord or, indeed, any delicate organs, but continue somewhat diminished in size to the dorsal musculature, or to the sides of the face, and the flow of blood is not impeded or distributed by the rete. It is certain, nevertheless, that the rete has some fairly intimate relation with the nervous system, since it enwraps the spinal chord at its anterior extremity and spreads out over the hinder surface of the brain.

Murie (1873, pp. 290–1) believed the retia to have a physiological function connected with nutrition. "Their office is equivalent to modified blood glands in some way related to pabulum or nutrient fluid. The Retia Mirabilia in Cetacea and other mammals are not confined to the cerebro-spinal tract and neighbourhood of the respiratory apparatus but principally follow lines where lymphatics and absorbents occur in the greatest profusion. Moreover in Cetacea, Sirenia[1], and Phocidae, where the Retia are most manifest, the lymphatics are unusually abundant and of large size. I apprehend that countless divisions, by coming into close contact with the lymphatic system, conduce to an interchange or exudation of their contents." Murie's theory is based on the similarity of position of the lymphatics and the tracts of vascular tissue similar to that already described in the inguinal region. The theory may well apply to these plexuses, but cannot hold for the thoracic and basicranial retia, where no lymphatic glands were found in relation with the vascular masses.

The retia mirabilia, or structures like them, are found in all mammals which are capable of diving and of remaining under the surface for long periods—that is in seals, porpoises, dolphins and whales. According to Owen the littoral and herbivorous Sirenia, which have not the habit of remaining so long submerged, do not possess these vascular networks. It seems reasonable, then, to connect the presence of these blood reservoirs with the capacity for making long and frequent dives.

It is well known that whales dive to considerable depths, but little or nothing is known of the actual depths they may reach. It is usual for a Blue or Fin Whale, when pursued, to make repeated dives of anything up to twenty minutes' duration. These long dives are known as "sounds". When the whale is progressing normally, surface dives are made which are neither so long nor so deep as the sounding dives. A number of these shallow surface dives always intervenes between two "sounds". Although the usual duration of a "sound" is between ten and twenty minutes, conversations with Norwegian gunners have revealed instances of longer dives than this. The Greenland Right Whale is said to be able to make sounding dives lasting up to forty-five minutes. As to the depths to which whales may descend when sounding very little indeed is known. Scoresby, jun. (1820, p. 468), stated that the Greenland Right Whale has been known to reach eight hundred fathoms. Such a depth, however, is extremely improbable. Racovitza (1903, pp. 17–19) considers that, when all factors have been taken into account, 100 metres is the maximum depth attainable. It is probable that the depths which whales can reach have been greatly overestimated in the past and that observers have taken the long periods of submergence to imply great depth. The limiting factor in any dive is the danger of caisson disease (liberation of nitrogen bubbles in the blood and tissues, especially the nervous tissues) upon returning suddenly from depths where the excess hydrostatic pressure is greater than 1·25 atmospheres (2·25 atmospheres absolute pressure). Human divers can descend to a depth where this pressure obtains (about 42 feet or 7 fathoms) and return to the surface with impunity; but at greater depths, involving greater pressures than this, precautions for the prevention of caisson disease must be taken, depending on the duration of the exposure to the increased pressure (Boycott, Damant and Haldane, 1908, p. 359). At a depth of 60–66 ft. (3 atmospheres pressure) a human diver can remain for a quarter of an hour, provided that his ascent to the surface occupies two minutes. He can remain at 96–108 ft. for a similar period, provided he takes in all 11 minutes to reach the surface (with a stop of 3 minutes at 20 ft. and 5 minutes at 10 ft.). At this depth the absolute pressure is 4 atmospheres. There is no *a priori* reason to suppose that a whale is less susceptible to caisson disease than any other mammal, but we may believe that it has become accustomed to slightly higher pressures, longer exposure, and to returning from these depths rather more quickly than a human diver. Even so it seems improbable that any organism could withstand the effects of swift release from pressures greater than 5 atmospheres—corresponding to a depth of 132 ft.

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[1] According to Owen (1868, p. 547) the Sirenia do not possess thoracic or myelonal plexuses.

It may be said, then, that a whale probably does not descend to depths much greater than 130 feet, but can remain below for periods of up to half an hour. In considering the effects of diving upon the physiology of the whale, the purely mechanical action of hydrostatic pressure can probably be discounted as a factor. In any case the purely mechanical effects of pressure during a dive are very slight. Animals under observation have been submitted to pressures of nearly 40 atmospheres and have apparently suffered no inconvenience (Report to the Admiralty of a Committee on deep-water diving, p. 11), while men in caissons can work freely at depths of 15 fathoms (about 4 atmospheres pressure) provided that ventilation is adequate. The pressure, however, during the dive will have a certain effect in increasing the partial pressure of the oxygen in the lungs. Paul Bert found that for a series of animals and birds oxygen became toxic at a partial pressure of 4 atmospheres. This partial pressure, however, corresponds to 15–20 atmospheres absolute pressure, or a depth of about 2000 ft., and it is impossible that a whale could ever reach such a depth.

The chief effects of the dive which must be considered, therefore, are those which arise from its duration rather than from its depth. The main result of a long period of submergence will be that the tissues will acquire a considerable oxygen debt. The chief difficulty, in fact, with which the whale will be confronted during the dive will be that of obtaining, or of taking down, sufficient oxygen for a submergence of twenty minutes to half an hour. At rest a man uses 220 c.c. of oxygen per minute and under conditions of moderate exercise about 500 c.c. Assuming that the total amount of air in the lungs at any moment is 7 litres (1·5 litres of oxygen) there would be enough oxygen in the lungs at any moment to last for three minutes of moderate exercise or 25 seconds of strenuous exercise. Thus if the whale's metabolism is in any way comparable with that of a man he will need to take down, when diving for half an hour, a store of oxygen at least twenty times greater than the amount the lungs could contain at the moment of submergence. It is known, however, that provided the brain and nervous system are kept supplied with oxygen, a man may incur a debt in his tissues equal to ten times the amount of oxygen in the lungs—that is 15 litres, or enough for 30 minutes' moderate exercise and about 4 minutes' strenuous exercise.

All attempts to ascribe a function to the vascular networks described in this paper must necessarily be purely speculative. It is fairly evident, however, that all theories which attribute to the retia the function of counteracting the effects of hydrostatic pressure on the distribution of blood in the body and on the circulation generally are without value. Hydrostatic pressure probably makes no difference to the circulation at all, since it is equally distributed within and without the body. The networks are far more likely to be concerned in some way with gaseous exchange, especially as they are present in seals and porpoises, which do not dive to great depths but can remain submerged for long periods. In this connection the situation of the networks near the respiratory centre and on the course of the main blood vessels and also around the brain and nerve chord is extremely suggestive. It has already been mentioned that the masses of the rete are abundantly charged with fat. Oxygen is very soluble in fats. In a table of solubilities of oxygen in a selection of animal and vegetable oils Lewkowitsch (1904, chap. vii) gives the oxygen absorption of whale oil, as shown by Livache's method with lead, to be considerably higher than that of any other oil. The figures are as follows:

After 3 days' exposure at N.T.P.	100 parts of	cod liver oil	absorb	6·382 O_2
	,,	whale oil	,,	8·266
	,,	sperm oil	,,	1·629
	,,	Japan fish oil	,,	8·194

The oxygen absorption of whale oil is thus nearly half that of ordinary blood. These figures are only given to show that the fatty tissues of the whale's body, and perhaps the fatty masses of the retia mirabilia in particular, are capable of absorbing comparatively large quantities of oxygen, but it is not suggested that they have any other value in the present discussion[1]. It may be imagined that some chemical mechanism exists for a more speedy transfer of oxygen from the blood to the fatty masses of the retia, which may thus act as an oxygen storage mechanism. The retia may in fact be capable of forming a sort of accessory lung. Since the vascular networks are under the control of the somatic nervous system, they may possibly be engorged with blood at will from the posterior thoracic artery, and this blood may perhaps be discharged at will again into the posterior thoracic vein. The proximity of the retia to the heart is extremely suggestive in this connection, since it implies that the blood has only a short distance to travel before reaching the fatty masses where it is to be stored. Thus during the successive inspirations which the whale takes at the surface before sounding, the blood discharges oxygen into the fat of the rete, and this oxygen is subsequently liberated into the circulation during the period of submergence.

It has already been remarked that a greatly increased oxygen debt can be incurred in the tissues if the brain and nervous system are kept supplied with oxygen. It is possible that the rete may form, by means of its oxygen-charged fatty masses on the anterior part of the spinal chord and around the hinder part of the brain, a means of keeping the main nervous centres supplied with oxygen during submergence. The basicranial rete may be looked upon as a secondary oxygen reservoir for blood destined for the side of the head, face and orbit.

According to this theory of the functions of the retia mirabilia it may be imagined that during submergence blood returns to the heart, not through the postcava, but through the intraspinous veins and the two great sinuses in the neural canal. Thus venous blood from all parts of the abdomen and hinder extremities is made to pass through the thoracic rete into the posterior thoracic vein. It thus enters the right auricle after having been re-oxygenated in the rete. It might be expected that if this actually takes place, and the heart, as a result of this process, receives already oxygenated blood in the right auricle, some mechanism would exist for "short circuiting" the pulmonary artery. No mechanism was found in the Fin Whale except that the ductus arteriosus is very wide and has a spacious lumen. It might easily be imagined to lead blood from the right ventricle into the systemic arch. Lacoste and Baudrimont (1926, pp. 1148–50) found annular folds in the muscular walls of the pulmonary artery of *Delphinus delphis*, which, the authors suggested, might have the effect of impeding the flow of blood in that artery when fully erected in its lumen. Similarly the small intrapulmonary branches of the artery "se pulverisent en bouquets extrêmement touffus d'artérioles très onduleuses" the effect of which would also be to block the flow of blood through the lungs.

[1] Sir Sidney Harmer has drawn my attention to the view held by many whalers and accepted by some writers that the Sperm Whale descends to especially great depths. If this opinion is based on the duration of the "sounds" which the Sperm Whale makes, we should expect to find in the oil of this species a high oxygen solubility. The results tabulated on page 359 show, however, that the solubility is decidedly lower than in other whales. The retia of the Sperm Whale were not examined in detail, but a superficial inspection indicates that they are of even greater extent than in the Fin Whale. They can be seen within the thorax as far back as, I think, the 8th rib. This might be expected if the oxygen solubility of the oil of this species is less than that of Fin Whale oil.

The fact, mentioned above, that the first and second intercostal spaces are not supplied with blood from intercostal arteries or drained by veins, seems to be in accordance with this theory of the functions of the retia mirabilia. The first and second intercostal spaces are in intimate contact with the fatty masses of the rete. They are thus closely related to a source of oxygen supply during the long period of sustained contraction during submergence.

SUMMARY

1. A description has been given of the retia mirabilia from the dissection of two Fin Whale foetuses, 0·86 metre (male) and 1·73 metres (female) in length.

2. The thoracic rete is a fatty vascular mass lying at the anterior end of the thorax and the base of the neck in the fork of the scalenus and rectus capitis anticus major muscles. It is in contact with all the vertebrae from the first and second cervical to the fifth and sixth dorsal. It extends between their transverse processes up into the neural canal through the large foramina between the neural spines.

A further vascular mass has been found lying against the basis cranii close to the tympanic bulla.

In the cervical region the neural canal of the vertebral column is filled with a dense venous plexus.

3. These vascular masses surround certain blood vessels, but do not block either their arterial or venous channels. The vessels which the thoracic vascular mass surrounds are the ascending branches of the posterior thoracic artery and the intraspinous veins descending from the large neural sinuses to the posterior thoracic vein. The basicranial vascular mass surrounds the cervico-facial artery and drains into, but does not surround, the pterygo-maxillary vein.

4. The postcaval and precaval venous systems in the Fin Whale have been found to be in wide communication by means of a pair of sinuses in the neural canal of the vertebral column, accompanying the spinal chord. There is a large venous plexus in the lumbar region which probably facilitates this communication.

5. The intercostal blood supply has been described to show:

(i) That it is derived from four sources as follows: internal mammary arteries and veins, azygos veins and segmental arteries, posterior thoracic arteries and veins, and the thoracic rete.

(ii) That the blood supply to the intercostal spaces becomes increasingly generous, proceeding in a rostral direction until the first two intercostal spaces are reached. These have no direct vascular supply, but are overlaid by the rete.

(iii) That the return of blood from the intercostal muscles behind the 7th rib is effected by a pair of small veins, thought to be homologous with the azygos veins of other mammals.

(iv) That the posterior thoracic arteries and veins of the Fin Whale are probably homologous with the superior intercostals of other mammals.

6. The relation of the retia mirabilia to the nervous system has been described. The thoracic rete is innervated both from the somatic (spinal) and from the sympathetic systems. The basicranial rete is innervated from the trigeminal nerve.

7. The possible function of the retia mirabilia has been discussed. It has been suggested that they act as a kind of accessory lung: the fat absorbs oxygen from the blood during progression at the surface, the oxygen returning into the circulation during submergence.

The work on which this paper is based was carried out at the Marine Biological Station of the Discovery Investigations, South Georgia, during the southern summer 1929–30.

I wish to thank Sir Sidney Harmer, Dr J. F. G. Wheeler, Professor J. Barcroft, Professor A. V. Hill and Dr C. G. Douglas for valuable suggestions, and for the interest they have shown in the subject.

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THE URINO-GENITAL SYSTEM OF THE FIN WHALE (*BALAENOPTERA PHYSALUS*)

WITH APPENDIX
THE DIMENSIONS AND GROWTH OF THE KIDNEY OF BLUE AND FIN WHALES

By

F. D. OMMANNEY, A.R.C.S., B.Sc. (Lond.)

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THE URINO-GENITAL SYSTEM OF THE FIN WHALE (*BALAENOPTERA PHYSALUS*)

By F. D. Ommanney, A.R.C.S., B.SC. (LOND.)

(Plates II, III; text-figs. 1–39)

INTRODUCTION

THE urino-genital system of the Cetacea has been frequently described. Hunter (1787) and Rapp (1837) were among the earliest authors to give an account of it. Since these authors wrote, Yves Delage (1885), who described the gross anatomy of a stranded specimen of an adult *Balaenoptera musculus* (now *B. physalus*), Turner (1870), Beauregard and Boulart (1882) and Daudt (1898) have given the best accounts of the system. Struthers (1893) described the muscles in the genital region in a paper which has formed the basis of all subsequent accounts. Meek (1918) and Anthony (1922) also made contributions to this subject, the former dealing with the genital system of *Phocaena communis* (now *P. phocaena*) and the latter that of *Mesoplodon bidens*. Anthony's paper treats the subject comparatively but describes only the male sex.

With the exception of Anthony's paper, however, there is a scarcity of clear figures in the literature of this subject, so that a still further contribution will not be out of place if it does no more than make good this deficiency. In some of the earlier descriptions the material used had evidently been long preserved in formalin and seems to have undergone distortion. This is especially noticeable in Daudt's paper.

During the course of the work the author was particularly struck by certain primitive and distinctive features in the urino-genital system of the Fin whale. An attempt has been made in what follows to emphasize these points and to consider them comparatively with relation to the conditions found in other orders and sub-orders of Mammalia, with a view to making deductions, if possible, concerning the relationship of the Cetacea to other mammals.

The material upon which this work was carried out consisted of four fin whale foetuses—two males 2·65 and 1·23 m. in length and two females 2·1 and 1·73 m. in length. Dissections of these were made at the Marine Biological Station at South Georgia during the southern summer of 1930–1. A great many kidneys were extracted during work on the flensing platform. These were measured and examined in the laboratory and form the basis of the account of the kidney and the tabulated measurements at the end of this paper.

The author wishes to thank Sir Sidney Harmer, K.B.E., F.R.S., and Dr J. F. G. Wheeler, late of the Discovery Investigations, for valuable help and advice and also Mr E. R. Gunther, of the Discovery Investigations, for useful criticism.

THE MALE GENITAL SYSTEM

EXTERNAL

Since the testes are abdominal the only part of the generative system which is visible externally in the adult is the smooth tapering penis (Plate II, fig. 1), which is normally withdrawn into a slit-like pouch in the ventral abdominal wall. In mature Fin whales the penis varies in length from 2·0 to 2·5 m. (Mackintosh and Wheeler, 1929, p. 380), while in immature whales it is usually nearer 1·0 m. When the penis is completely withdrawn only the genital slit can be seen. The slit lies in front of the anus, the distance between the centres of the two openings being equal to about 6–7 per cent of the total length of the body (Mackintosh and Wheeler, 1929, p. 324). The deep genital slit is usually accompanied by a set of short converging grooves. Two of these, the most pronounced, lie immediately behind the slit (Plate II, fig. 1) and converge towards a point on the mid-ventral line of the body about half-way between the anus and the genital slit. Two others flank the slit and converge anteriorly. A raphe, more distinctly seen in the foetus, runs from the posterior side of the root of the penis along the skin in the middle line to the anus.

It is a character common to all Cetacea that in the adult and in later foetal life the penis is, except in the erected condition, withdrawn into such a pouch with swollen lips on the ventral surface of the abdomen. In the stallion also the penis is withdrawn into a very similar pouch of skin. There seems to be some confusion in the literature with regard to the correct term for this slit and for the various parts of the penis. The penis is smooth and tapering, with a conical terminal portion, occupying about one-third of its length, at the apex of which the urethra opens. Around the base of the cone there is a slightly raised fold of integument. The confusion in the terminology seems to have arisen from the fact that the various authors have described the penis in different states of contraction and to the doubt which exists whether the conical terminal part is a true glans or not. Eschricht (1849, p. 81) held the conical terminal portion to be a true glans, and therefore considered the ring-like fold of skin at the base equivalent to a praeputium. Beauregard and Boulart (1882, pp. 169–75), who did not consider the terminal portion to be a true glans, speak of the genital slit as "a sort of praeputial sac". In one of the two *Phocaena* embryos and a Beluga embryo described by Daudt (1898, pp. 243–5) the genital slit was not yet developed and the penis was apparently free on the abdominal wall. This author appears to apply the term "preputium" to the whole of the sheath of skin surrounding the penis as far as the base of the terminal cone. He placed the same interpretation upon the structures observed in *Balaenoptera* (p. 289). Daudt wrote "the point of involution (Umschlagstelle) of the pseudopraeputium"—that is the ring of skin around the terminal cone—"is recognizable in a fully everted penis as a slight ring-like protuberance. If the shaft is inverted the pseudopraeputium disappears but is represented by the whole penis sac". [The "penis sac—Penistasche"—was Weber's term (1904, p. 260) for the genital slit.]

In this paper it is proposed to adopt Eschricht's interpretation and to call the ring-like fold of skin at the base of the terminal cone a "praeputium" and to reserve the term "penis sac" for the genital slit. The reasons for this will be stated when the homologies of the terminal cone are discussed.

The "penis sac", into which the penis is normally withdrawn in the adult, does not make its appearance until fairly late in foetal life. In foetuses less than about 3 m. in length the penis projects free upon the surface of the abdomen. In the smaller of the two foetuses examined in the present work (1·23 m.) the penis was quite free and no sign of the penis sac was to be seen. In the larger foetus (2·65 m.) the sac was foreshadowed by a distinct triangular insinking of the body wall in front of the penis, forming a sort of socket into which the organ fitted. It may thus be assumed that the penis sac is a secondary feature of the genital system of the Cetacea. In the stallion the penis is retractile into a similar fold of skin by means of a pair of retractor muscles, as in the Cetacea. In some Marsupials, some Insectivora, Felidae, *Elephas* and Tylopoda (Weber, 1904, p. 260) the penis lies in a sac, which, however, also includes the anus and is surrounded by a sphincter cloacae. The penis in these animals emerges backwards and becomes turned forwards during erection, so that no comparison can be drawn between them and the Cetacea.

At a point situated about two-thirds of the distance from the base of the penis to the anus, opposite the caudal extremities of the posterior genital grooves, is a pair of small lateral pits. In the foetus 1·23 m. in length they were 1·0 cm. apart.

These are the rudimentary male nipples. In the foetus 2·65 m. long they had nearly disappeared and were seen only as a pair of very shallow depressions 9·0 cm. apart. In the adult they are absent. Sections failed to reveal any trace of glandular structure in the pits except for a slight vascularity of their walls.

The male mammary apparatus appears less developed in *Balaenoptera physalus* than in *B. rostrata*, where, according to Kükenthal (1893, p. 356), the male nipple develops as far as the formation of a mammary sac, such as is found in the female foetus during the development of the nipple. Later the sac is reabsorbed in the male. In the Porpoise, however (Kükenthal, 1893, p. 356), the male nipple rudiment still exists in the adult and its development proceeds yet a step further. A papilla forms at the base of the sac. In *Platanista gangetica* a sphincter develops around the opening of the sac.

The following are the measurements of the external genitalia of the two male Fin whale foetuses dissected.

Length of body (tip of snout to notch of flukes) ...	2·65 m.	1·23 m.
Length of penis (base to tip)	14·7 cm.	4·75 cm. (partly retracted)
Diameter of penis at base	3·0 cm.	
Diameter of penis at praeputium	1·2 cm.	
Distance from the base of the penis to anus ...	15·3 cm.	8·0 cm.
Distance from the base of the penis to the mid-point between the nipples	10·1 cm.	3·0 cm.
Distance between the nipples	9·0 cm.	1·0 cm.

MUSCULATURE

An excellent account of the general musculature of the region has been given by Schulte (1916), who described a foetal Sei whale (*Balaenoptera borealis*), and it is not intended here to do more than give a brief outline of the main muscles based on Schulte's account.

The panniculus carnosus is a thin sheet of muscle fibres belonging to the dermal series, extending over the whole anterior and middle part of the body beneath the blubber layer, but forming a fibrous sheath upon the pedicle behind the anus. The pannicular layer is thickest and most pronounced in the ventral abdominal region and over the cavum ventrale. A latero-dorsal aponeurosis towards which the fibres of the panniculus are directed divides them into a ventral and a dorsal series. The fibres of the dorsal series are directed almost vertically downwards towards this aponeurosis, while those of the ventral series pass upwards somewhat more rostrally from their origin in the mid-ventral line. Around the umbilicus the origins of the ventral series on each side separate, leaving a gap which admits the structures of the umbilical cord. The panniculus is not continued on to the umbilical cord itself. Immediately in front of the base of the penis the panniculus forms a thick muscular mass which is continued on to the organ and forms a muscular sheath in its proximal extremity. This mass is interposed anteriorly between the base of the penis and the rectus abdominis muscle.

The obliquus internus muscle is a fair-sized sheet with rostro-ventrally directed fibres arising in the lumbar region from the latero-dorsal aponeurosis already mentioned. At the dorsal margin of the rectus abdominis the obliquus internus divides into two sheets. These become fibrous and form a sheath for the rectus. The superficial sheet is inserted upon the linea alba, and the deep layer is aponeurotic upon the sheath of the rectus muscle internally. The more rostral fibres of the deep layer are inserted upon the caudal margins of the cartilages of the last seven ribs close to the slips of origin of the rectus (Schulte).

In its central and caudal portions at any rate, the rectus abdominis is thus enclosed in a fibrous sheath derived from the forking into two layers of the obliquus internus. Schulte states that dorsally the aponeurosis of the transversalis (a thin horizontally directed sheet dorsal to the rectus) is concerned in the formation of this sheath.

The rectus abdominis forms a thick mass on the venter of the abdomen, the fibres running rostro-caudally. The linea alba, formed in the mid-ventral line by the fusion of the sheaths of the recti of the two sides, separates the rectus muscle of each side from its antimere. At the umbilicus the two muscle masses diverge to admit the cord so that the muscle fibres are not continued upon it. In the posterior part of the abdomen, immediately in front of the penis (or vulva in the female), the separation of the recti of the two sides becomes very pronounced and a triangular gap is left filled with fibrous tissue and roofed, ventrally, by a thick muscle mass derived from the panniculus. Lateral to the inguinal region the rectus has three terminal insertions. The smallest and least important of these is the insertion upon the ectal border of the rudimentary pelvis (iliac portion, Fig. 1 l^2). Of the two main terminations the superficial one is a triangular wedge of muscle which thins out upon the fibrous fascia between the hypaxial muscle and the origin of the ischio-caudalis. It thus forms a lateral wedge bounding the external genital structures (Fig. 1 l^3). The third and main insertion of the rectus upon the chevron bones can only be seen when the main body of the rectus and the rudimentary pelvis are drawn aside (Fig. 1 l^1). The fibres of this deep portion of the muscle run dorsally and caudally to be inserted upon the anterior chevron bones. The insertion of the rectus caudally is thus threefold. Between the deep and superficial parts of this insertion (that is between the portion inserted upon the chevron bones and the iliac portion) a foramen is left through which nerves and blood vessels obtain admission to the penis (and to the clitoris in the female).

The transversalis muscle has already been mentioned. It is a thin transverse sheet passing dorsal to the rectus muscle between the latero-dorsal aponeuroses of opposite sides of the body. Its extent is about the same as that of the obliquus internus.

The ischio-caudalis (Fig. 1 l^5) is a broad but thin sheet on each side of the mid-ventral line in the caudal region. Dorsally it is bounded by the deep portion of the hypaxial muscle and laterally by the superficial part. In the middle line the antimeres of the two sides are separated by a thin raphe as far forward as the anus, where they diverge to give passage to the rectum (Fig. 1 *o*). Anteriorly the ischio-caudalis muscles of each side arise extensively by their lateral fasciculi from the inner sheath of the rectus abdominis and by their inner fasciculi from the ectal margin of the ischial portion of the pelvis. The fibres of the ischio-caudalis extend inwards and caudally and are inserted (Schulte) upon the tips of the chevron bones as far back as the junction of the pedicle with the flukes. Between the ischio-caudalis and the hypaxial muscle, opposite the tip of the triangular insertion of the rectus, a large lumbar vein from the surface of the pedicular region is admitted, running forwards and inwards to its junction with the iliac vein (Fig. 1 k^3). No artery accompanies this vein, but there is a stout lumbar nerve running with it from the main genital nerve from which it arises in the inguinal region.

Anteriorly the ischio-caudalis of each side diverges from its antimere to give passage to the anus and rectum. From the anus forward to the penis the ischio-caudalis muscles are separated by a transverse sheet of muscle—the levator ani (Fig. 1 l^4). This muscle is fairly thin in the male but considerably thicker in the female. It takes origin from the deep surface and inner border of the ischio-caudalis and its fibres are continued on to the base of the bulbus penis of the male and the walls of the vulva of the female (Fig. 11 *i*). The antimeres of opposite sides are united in the mid-ventral line below the rectum by a raphe. Schulte describes the levator ani as taking origin anteriorly from the ental surface of the pelvis, but this was not confirmed.

A small transverse muscle, the coccygeus, was found behind the anus (Fig. 1 l^{11}).

The hypaxial muscle (Fig. 1 l^6) is an immense mass extending throughout the whole length of the body ventral to the transverse processes of the vertebral column and occupying, in the lumbar and pedicular regions, the space between the transverse

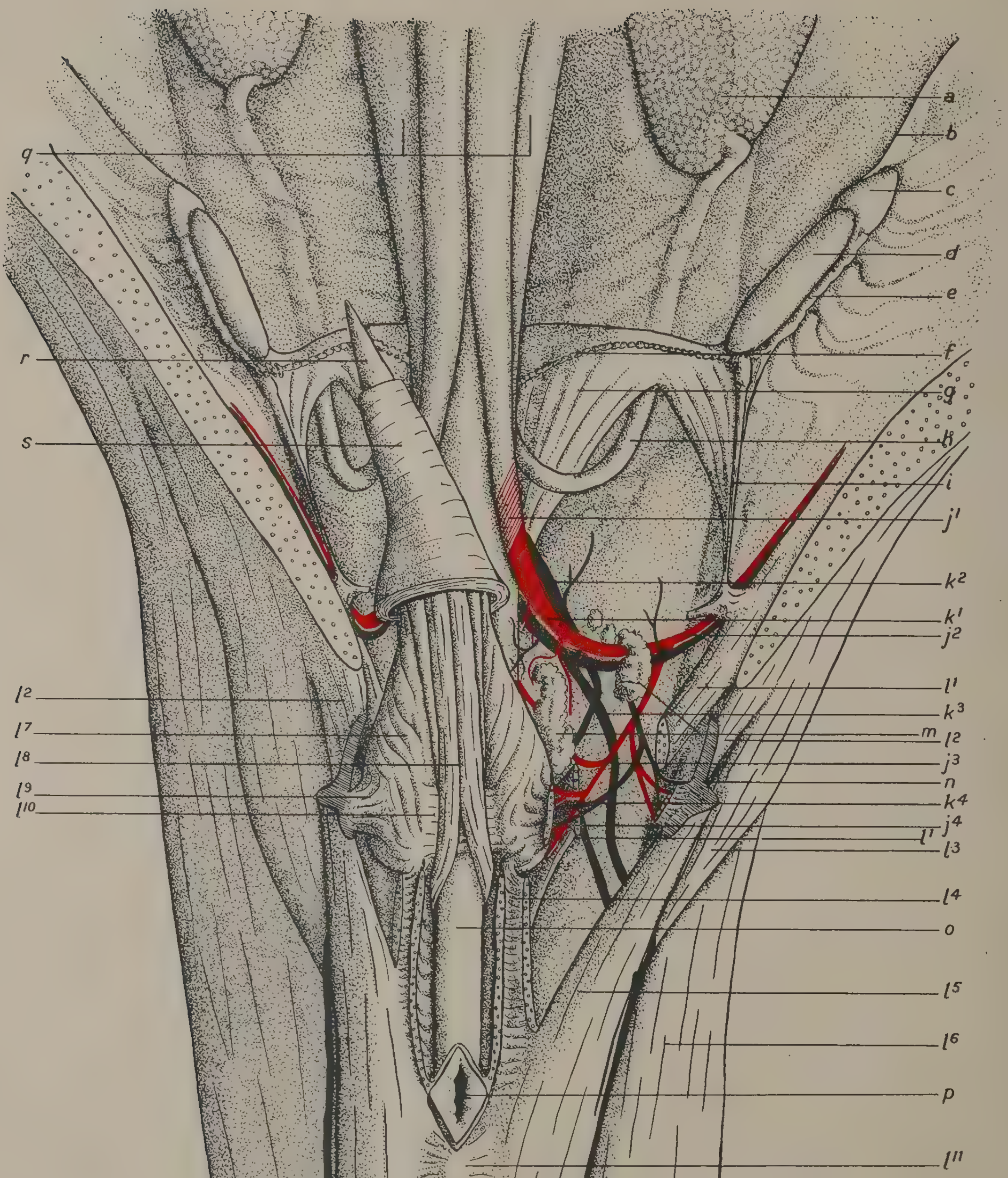
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Fig. 1.

processes and the bodies of the vertebrae. Against its extensive surface lie the kidneys and the generative tract, the intestine and rectum and the aorta and postcavae, which are interposed between the muscle masses of opposite sides. In the lumbar and pedicular region the hypaxial muscle is divided into two tracts—a deep portion against the bodies of the vertebrae and the transverse processes, and a superficial portion more ventrally abutting on the hypapophyses of the vertebrae.

The transversarius muscle occupies the region of the transverse processes laterally. For its origins and insertions and for further details of those of the muscles of this region see Schulte, 1916, pp. 426–7.

INTERNAL ORGANS

The penis

The smooth tapering penis is enclosed as far distally as the praeputial fold by a musculo-fibrous sheath (Figs. 2 *e*, 3 *e*). The muscular elements in this sheath are pronounced proximally and form a moderately thick circular layer derived from the panniculus carnosus. Distally these muscles give place to fibres directed circularly around the shaft of the organ.

The penis may be considered to consist of two parts, an external part comprising the main shaft of the organ together with the conical terminal part, and an internal portion not visible externally where the shaft of the organ swells out to form the bulbus penis. In the adult and later foetal life the external part is retractile into the "penis sac". Although in young foetuses the "penis sac" is not developed the retractor muscles are yet capable of action and, in preserved specimens at any rate, are in a state of contraction causing an artificial shortening of the external part of the organ and the formation of a circular collar of skin into the middle of which the terminal cone is pulled down. In the

Fig. 1. Internal genitalia of a male Fin whale foetus 2·65 m. in length.

a. Kidney.
b. Plica diaphragmatica.
c. Caput epididymis.
d. Testis.
e. Cauda epididymis.
f. Vas deferens.
g. Ligamentum latum.
h. Ureter.
i. Genital cord (mesorchiagos).
j^1. Hypogastric artery.
j^2. Epigastric artery and vein.
j^3. Pudic artery.
j^4. Cavernous arteries and veins.
k^1. Iliac vein.
k^2. Large subsidiary vein in inguinal plexus.
k^3. Lumbar vein.
k^4. Pudic vein.
l^1. Caudal attachment of rectus abdominis muscle.
l^2. Iliac attachment of rectus abdominis muscle.
l^3. Superficial attachment of rectus abdominis muscle.
l^4. Levator ani muscle.
l^5. Ischio-caudalis muscle.
l^6. Hypaxial muscle.
l^7. Ischio-cavernosus muscle.
l^8. Retractor penis muscle.
l^9. Ischiac attachment of ischio-cavernosus muscle.
l^{10}. Bulbo-cavernosus muscle.
l^{11}. Coccygeus muscle.
m. Inguinal lymph glands.
n. Pelvic rudiment.
o. Rectum.
p. Anus.
q. Bladder.
r. Terminal cone of penis.
s. Pannicular sheath of penis.

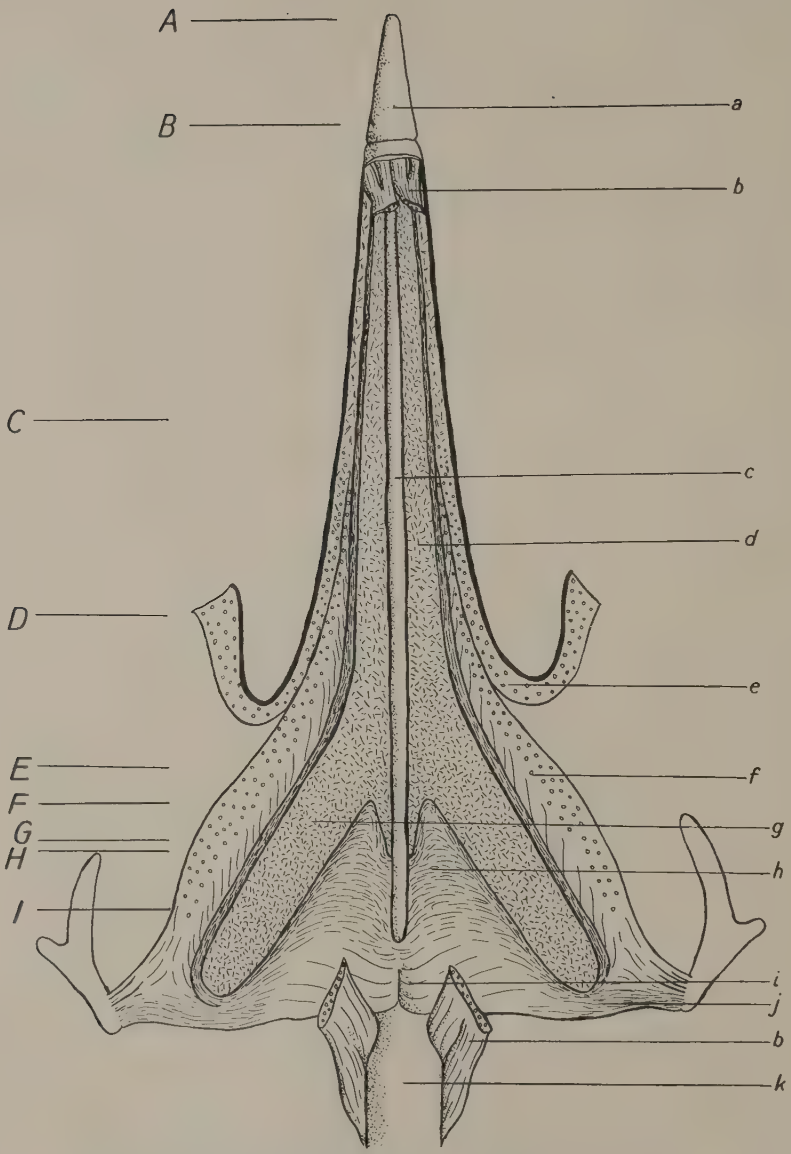

Fig. 2. Longitudinal horizontal section of penis of Fin whale.

a. Terminal cone.
b. Retractor penis muscles (cut).
c. Corpus spongiosum urethrae.
d. Shaft of corpus cavernosum penis.
e. Pannicular sheath of penis.
f. Ischio-cavernosus muscle.
g. Crus corporis cavernosi.
h. Triangular ligament.
i. Bulbo-cavernosus muscle.
j. Interpelvic ligament.
k. Rectum.

A, *B*, *C*, *D*, *E*, *F*, *G*, *H* and *I*. Levels of transverse sections in Fig. 4.

larger of the two foetuses examined (2·65 m.) the external portion of the penis was fully extended, and the ratio of its length to that of the internal part was 1·3 : 1·0. In the smaller specimen the penis was partially retracted and measured 4·75 cm., while the internal part measured 3·75 cm. The dimensions of the internal part were never seen in the adult, but from external appearances it could not have measured more than about a third of the length of the outer shaft of the organ.

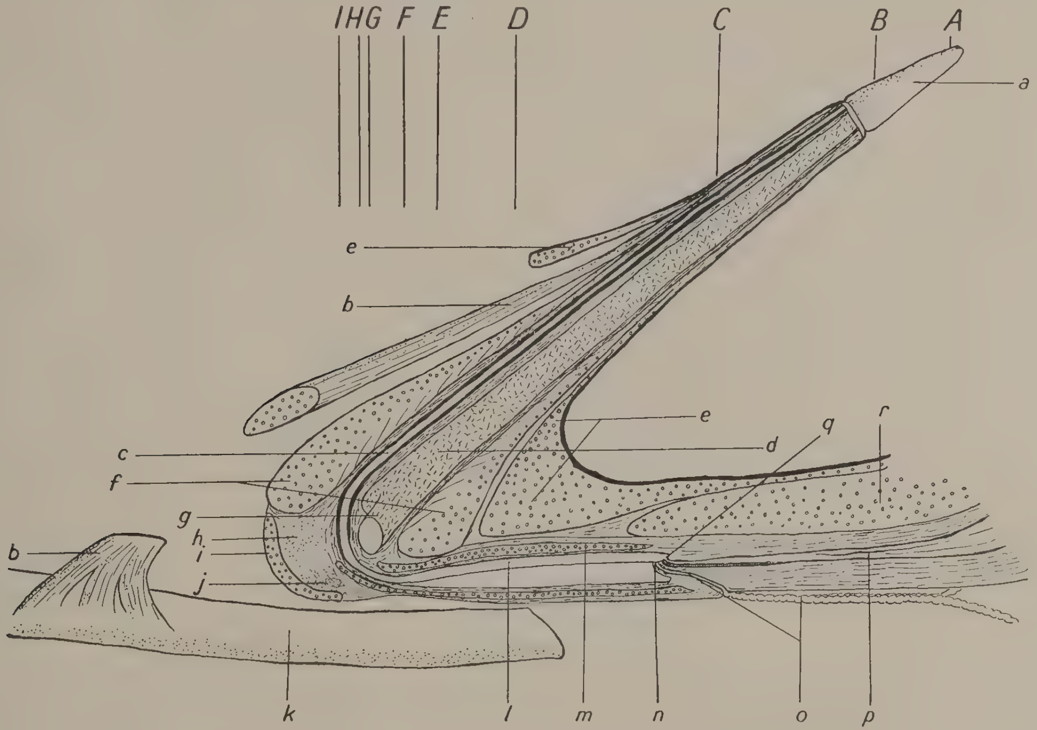

Fig. 3. Longitudinal sagittal section of penis and genito-urinary ducts in Fin whale.

a. Terminal cone.
b. Retractor penis muscle.
c. Spongy portion of urethra.
d. Corpus cavernosum.
e. Panniculus carnosus.
f. Ischio-cavernosus muscle.
g. Crus corporis cavernosi.
h. Triangular ligament.
i. Bulbo-cavernosus muscle.
j. Interpelvic ligament.
k. Rectum.
l. Prostatic portion of urethra.
m. Compressor prostatae muscle.
n. Verumontanum with seminal pores.
o. Vas deferens.
p. Urinary duct.
q. Urinary pore with crista urethrae.
r. Rectus abdominis muscle.

A, *B*, *C*, *D*, *E*, *F*, *G*, *H* and *I*. Levels of transverse sections in Fig. 4.

In describing the penis it has been decided to refer to the "anterior" and "posterior" aspects of the organ, and to abandon the terms "ventral" and "dorsal", employed by Daudt and other authors, in view of the central position of the penis in the middle line of the body.

Within the body the penis enlarges, as has been already stated, to form a pear-shaped bulbus (Figs. 1, 2, 3). The greatest width of the bulbus is about one-third the extreme length of the penis from the tip to the base of the bulbus. The bulbus forms two rounded bosses at the base of the organ, the whole mass having a pear shape. It contains the forks of the corpus cavernosum (the crus) but the main body of the bulbus consists of a muscular mass—the ischio-cavernosus muscle or erector penis (Figs. 2*f*, 3*f*).

The corpus cavernosum and corpus spongiosum.

Before considering this muscle mass, however, it will be more convenient to describe the corpus cavernosum itself. It forms the main erectile mechanism of the penis and occupies the shaft of the organ from the terminal cone to the centre of the bulbus (Figs. 2, 3 *d*, *g*). Distally, where there is a paucity of muscle fibres around the shaft, the corpus occupies the greater part of the diameter of the penis and a transverse section in the distal portion consists almost solely of the corpus cavernosum with its fibrous sheath and accompanying corpus spongiosum (Fig. 4 *C*, *D*). Proximally and within the bulbus the corpus is embedded in the muscle masses that surround that part of the organ. The diameter of the portion of the corpus occupying the shaft of the penis decreases uniformly towards its distal extremity, but the shape of its cross-section varies considerably. In a section across the terminal cone (Fig. 4 *A*, *B*, *C*) the corpus appears distinctly bean-shaped, with an indentation posteriorly towards the corpus spongiosum. The indentation forms a groove admitting the corpus spongiosum, running from near the tip of the terminal cone to the base of the external part of the organ. At the root of the organ, opposite the reflection of the panniculus carnosus on to its sheath, the section of the corpus cavernosum (Fig. 4 *D*) becomes oval, the long axis of the oval being directed antero-posteriorly. In the middle of the bulbus the corpus cavernosum forks to form the crus (Figs. 2, 4). Within the shaft of the penis there is no sign whatever of any division of the corpus cavernosum into two parts. The arms of the crus are directed postero-laterally and make an angle of about 45° with one another. They are directed into the posterior bosses of the bulbus where they terminate. Distally the arms of the crus are nearly circular in cross-section (Fig. 4 *G*, *H*, *I*), proximally they take on an oval outline. The extremities of the crura are attached to the pelvic bones by the interpelvic ligament shortly to be mentioned. In the angle between the crura there is a small medianly projecting lobe of cavernous tissue, forming a backwardly directed tongue abutting upon the urethra at the commencement of the corpus spongiosum (Figs. 2, 4 *G*, *H*, a^2). There is thus an undivided corpus cavernosum within the penis having the form of a Y with a main stem occupying the shaft of the organ and the arms directed backwards into the bulbus. The corpus has an outer investment of circular fibres and an extensive inner core consisting of cavernous tissue of the usual structure with abundant fibres and interstitial blood spaces.

The following are the measurements in the 1·23 m. foetus:

Length of the shaft of the corpus	3·5 cm.
Length of each arm of the crus	3·0 „
Diameter of the centre of the shaft	0·75 „
Diameter of the centre of each ramus	0·5 „

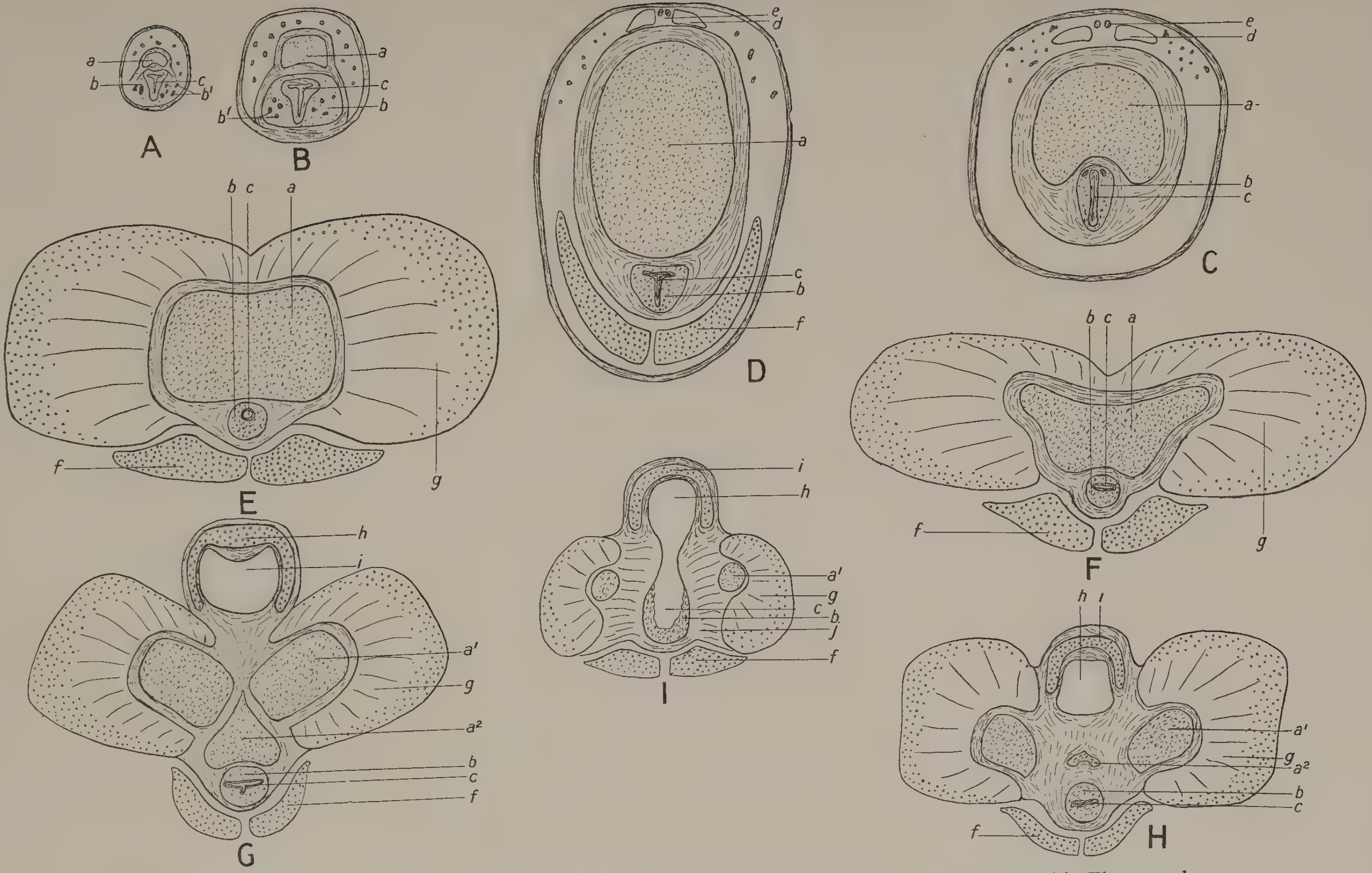

Fig. 4. Transverse sections of the penis in Fin whale, taken approximately at the points indicated in Figs. 3 and 4.

A and *B*. Through the terminal cone. Note that the spongy and cavernous bodies run together to the extreme tip. *C* and *D*. Through the shaft. *E* and *F*. Through the point of division of the corpus cavernosum. *G*, *H* and *I*. Through the crura.

a. Corpus cavernosum.
a^1. Crus corporis cavernosae.
a^2. Median fibrous lobe.
b. Corpus spongiosum.
b^1. Large blood sinuses in the corpus spongiosum.
c. Urethra.
d. Pudic nerves.
e. Pudic arteries.
f. Retractor penis muscles.
g. Ischio-cavernosus muscle.
h. Prostatic portion of urethra.
i. Compressor prostatae muscle.
j. Triangular ligament.

The corpus cavernosum is a single structure in all Cetacea with the exception, according to Anderson (1878, p. 474), of *Platanista gangetica*, where there are two corpora cavernosa which separate to form a crus. Kükenthal (1909, p. 575), however, in describing the penis of *Platanista*, showed that the corpus cavernosum is unpaired in the shaft, but forks distally into two lobes projecting upon the lateral aspects of the penis. The corpus spongiosum is also a single structure within the shaft and accompanies the forks of the divided cavernous body into the lateral lobes, but also sends a median prolongation to the end of the penis, carrying the urethra and unaccompanied by the corpus cavernosum. The corpus cavernosum of *Platanista* is thus only double distally and is evidently secondarily derived from the single condition. It can be said, then, that the Cetacea all show a single aseptate corpus.

The corpus spongiosum urethrae, containing within it the urethral canal, occupies a posterior position in the shaft of the penis (Figs. 2 *e*, 3 *c*, 4 *b*). It lies immediately against the posterior aspect of the corpus cavernosum, and between the forks of the crus it turns upwards and forwards through the centre of the "triangular ligament" which lies between them, and terminates immediately below the root of the penis where the urethra enters the prostatic part of its course. The corpus spongiosum has a very small diameter compared with that of the corpus cavernosum and is invested by the same fibrous sheath. The spongy tissue is denser and has fewer blood spaces than that of the cavernous body. Peripherally, however, are a number of large blood sinuses (Figs. 4 *A*, *B b*), passing in a longitudinal direction towards the terminal cone where they increase greatly in number and extent and render that portion of the penis highly vascular.

At the middle of the terminal cone, immediately distal to the praeputium, the corpus spongiosum is oval in section (Fig. 4 *A*, *B*) with the longer axis of the oval directed transversely. In the shaft of the penis, however, the longer axis of the oval is at right angles to its direction in the terminal cone and thus lies antero-posteriorly (Fig. 4 *C*). In the shaft the corpus spongiosum fits exactly into a groove in the posterior face of the cavernous body. It emerges from this groove on entering the muscular mass of the bulbus and becomes circular in cross section (Fig. 4 *E*). Thereafter, until it turns dorsally between the arms of the crus, the corpus spongiosum forms a projecting ridge upon the posterior face of the corpus cavernosum. Throughout the length of the corpus spongiosum its fibrous sheath is one with that of the corpus cavernosum and is directly continuous with that of the prostata, where the urethra suddenly enlarges after leaving the spongy part of its course.

Between the arms of the crus there is a tract of fibres, formed by the junction of the sheaths of the prostate, spongy body and the arms and shaft of the cavernous body. This forms a part of the "triangular ligament" of Struthers (Fig. 2 *h*) which will be mentioned shortly.

There is no bulbus spongiosum and no penis bone, although a penis bone was described by Turner in *Balaena biscayensis* (= *B. glacialis*).

In *Kogia breviceps* only among the Cetacea is the corpus spongiosum known to fork within the bulb of the penis to form a crus corporis spongiosi whose arms lie mesal and ventral to those of the crus corporis cavernosi (Benham, 1901).

The terminal cone

It has already been remarked that Eschricht (1849) regarded the terminal cone of the Cetacean penis as a true glans. Beauregard and Boulart (1882, p. 174) have a discussion on the subject and arrive at the opposite conclusion.

If we adopt the definition of a glans usually employed for man and other mammals—namely the reflection of the corpus spongiosum at the termination of the corpus cavernosum—then the terminal cone of the Cetacean penis cannot be called a glans. Transverse sections across it (Fig. 4 *A*, *B*) show that the corpora cavernosa and spongiosa continue together into the cone. The corpus cavernosum diminishes rapidly towards the tip, retaining its reniform shape with its longest axis transversely directed. The corpus spongiosum diminishes less rapidly and thus, within the cone, its cross-section is considerably greater than that of the corpus cavernosum, in comparison with which it becomes a wide structure with its long axis transversely directed (Fig. 4 *B*). It is no longer embedded in a groove on the posterior aspect of the cavernous body, but occupies, with its sheath, the greater part of the cross-section of the cone. The blood sinuses in it increase in size and number. Its sheath becomes progressively thinner towards the tip of the cone and at the extreme tip it finally disappears. Here (Fig. 4 *A*) the corpus cavernosum finally tapers away altogether, and the whole substance of the tip of the cone consists of spongy tissue derived from the corpus spongiosum. The whole cone is highly vascular, especially the tip where the sinuses from the corpus spongiosum reach the periphery. It is thus necessary to agree with Beauregard and Boulart, who pointed out that there is no true reflection of the corpus spongiosum over the corpus cavernosum and that the latter proceeds right to the tip of the cone. The terminal cone is, therefore, not a glans in the true sense of the word. The same authors, describing an adult cone 0·56 m. in length, found that 3·0 cm. from the extreme tip the cone "se renfle légèrement en une sorte de bourrelet circulaire", so that the posterior face of the cone becomes obliquely truncated up to its extremity. An oblique concave surface is thus constituted with the opening of the urethra in the centre. These authors were of opinion that this concave surface corresponds to the glans and the circular fold (bourrelet) to the corona. This homology, however, is difficult to establish. The part corresponding to the glans, according to Beauregard and Boulart, is a concave surface, and its underlying spongy tissue is the same as that which makes up the rest of the terminal cone. It seems certain that the cone itself is not a true glans and it is proposed to employ the term "terminal cone" when speaking of this part of the penis.

The urethral canal, lined by a columnar epithelium several layers thick, occupies a somewhat excentric position within the corpus spongiosum, lying slightly anteriorly towards the corpus cavernosum (Fig. 4 *E*, *F*, *G*). The opening of the urethra at the tip of the terminal cone occurs on the posterior face of the cone, and the anterior lip considerably overhangs the posterior, as described by Beauregard and Boulart, causing the concavity which they compared with a glans. From its opening the urethra passes obliquely through the tip of the cone to its posterior position in the penis. In transverse section the part of the canal traversing the cone has a T-shape (Fig. 4 *A*, *B*), the cross arm of the T lying against the corpus cavernosum. Where the corpus spongiosum occupies a groove in the posterior face of the corpus cavernosum within the shaft of the penis, the urethral canal is an antero-posteriorly directed slit in transverse section (Fig. 4 *C*) and lies centrally within the spongy body. At the base of the shaft the section of the urethra again becomes T-shaped (Fig. 4 *D*). Within the bulbus it is circular (Fig. 4 *E*), and finally, upon turning dorsally and just before widening to the prostate part of its course, it becomes a transversely directed slit (Fig. 4 *F*, *G*, *H*).

The musculature of the penis

We may now describe the musculature of the penis with reference to the cavernous and spongy structures.

The retraction of the penis, causing its withdrawal into the penis sac, is brought about by a pair of strap-like muscles (Figs. 2 *b*, 3 *b*, 4 *f*) lying along the whole of the posterior face of the organ. These—the retractores penis—take origin from the walls of the rectum immediately posterior and dorsal to the bulbus, and after running apposed to one another along the posterior face of the organ, flatten out distally and are inserted into the praeputial fold (Figs. 2, 3). Each muscle appears to have a double insertion upon the praeputium. Close to its insertion each retractor forks, so that one arm of the fork on each side is inserted into the praeputial fold laterally and the other posteriorly close to its antimere. The retraction of the penis is brought about solely by the action of these muscles, so that in its retracted state the length of the penis is only apparently, but not actually diminished, becoming bent within the body cavity into a sigmoid curve as figured by Daudt (1898, pl. 9, fig. 16) for *Phocaena* and by Kükenthal (1909, Taf. 49, fig. 25) for the same species.

The ischio-cavernosus or erector penis muscle (Figs. 1 l^7, 2 *f*, 3 *f*, 4 *g*), together with all the muscles of the genital and pelvic region in the male Fin whale, were studied in detail by Struthers (1893), whose figures have formed the bases of all subsequent accounts.

Between the ischial portions of the two pelvic bones a ligament extends which Struthers called the ligamentum interpelvicum. In its course between the two pelvic bones it involves the posterior extremities of the arms of the crus (Figs. 2 *j*, 3 *j*). Meek (1918) mentions also a strong ligament in the porpoise extending to a point on the pelvic bones near their ischial extremities and carrying the two arms of the crura. In *Balaena*, according to Struthers (1881), this ligament is powerful; but in the Fin whale it is feebly developed, as stated by Daudt (1898, p. 288), and is not the broad tract of fibres described and figured by Struthers (1893) for this whale. The triangular space between the arms of the crura is further filled by a ligament (Figs. 2 *h*, 3 *h*) with fibres directed transversely between the arms. This is the "triangular ligament" of Struthers. The triangular fibrous tract is continuous at its apex and along two sides with the fibrous sheath of the cavernous crura (Fig. 2 *h*) and along its base with the fibres of the "interpelvic ligament". Upon the ventral and posterior face of the bulbus it is covered by the bulbo-cavernosus muscle (Figs. 2 *i*, 3 *i*) which will be described presently. The urethra and corpus spongiosum pass through the "triangular ligament" where they turn dorsally between the crura from their passage through the shaft of the organ (Figs. 2, 3).

The ischio-cavernosus or erector penis muscle (Figs. 1 l^7, 2 *f*, 3 *f*, 4 *g*) appears to be powerfully developed in all Cetacea. According to Meek (1918) it has, in the porpoise, an attachment extending along the whole length of the pelvic bone, which it envelops completely. In *Mesoplodon* (Anthony, 1922, p. 97) it has a double origin, one from the whole length of the pelvic bone and the other from a small circular aponeurotic centre behind the pelvic bone. In *Kogia* (Benham, 1901), where no pelvic bone exists, there is a small ligamentous patch at the posterior end of the muscle from which the fibres radiate, and this small ligamentous patch is itself attached to the sphincter ani by a small separate muscle. In all Cetacea the main body of the muscle forms a large muscle mass confined to the cavernous body and forming the pear-shaped bulbus.

In *Balaena* (Struthers, 1881) the ischio-cavernosus takes origin from the inner border only of the pelvic bone and does not envelop it, by far the greater part of the muscle being confined to the bulbus. In *Balaenoptera physalus* the ischial part of this muscle is small and unimportant. Daudt (1898, p. 288) says: "Der Musculus Ischio-cavernosus, welcher vom hinteren Ende des Beckenknochens kommt, der bei seinem Beginn nur von wenigen sehnigen Faserzügen durchsetzt ist und noch nicht mit dem von Struthers beschreibenen Ligamentum Interpelvicum beginnt, umhüllt anfangs die beiden Corpora Cavernosa seitlich und teils dorsal und teils ventral". In the specimens examined in the present work the ischiac attachments of the ischio-cavernosus muscle appeared to be fibrous but slight, and the fibrous part joined other fibres coming from the transverse tract at the base of the bulbus (Fig. 2 *j*), the "interpelvic ligament".

The main fibres of the ischio-cavernosus muscle take origin from the lateral and posterior surfaces of the cavernous crura. After a short course forwards the fibres turn towards the anterior face of the penis and meet those of the opposite side in a median raphe. The muscle mass thins out very greatly upon the shaft of the organ, where its fibres have a more longitudinal direction. Anteriorly, at the extreme base of the bulbus, is an area between the ischio-cavernosus muscles of the two sides where the "transverse ligament" rests between the arms of the crus upon the ventral face of the prostate.

Struthers described and figured a semicircular septum dividing the ischio-cavernosus muscle into a proximal or posterior moiety, confined to the bulbus penis, and a distal or anterior moiety confined to the shaft of the penis. This, however, has not been confirmed in the present work. The muscle formed a single continuous mass adherent to the penis, and other authors, notably Daudt, who have examined the genital muscles, do not mention this semicircular septum of Struthers.

From the slight extent of that part of the ischio-cavernosus muscle attached to the pelvic bone it would seem that the function of this muscle must be to erect the penis, not by pulling upon the pelvic bone, but by compressing the proximal end of the corpus cavernosum and so driving the blood forward towards the terminal cone. The muscle will also have the effect to a less extent of squeezing the corpus spongiosum and urethra, driving the seminal fluid forwards during the orgasm. Yves Delage (1885, p. 131), however, was of opinion that the envelope of the corpus cavernosum was too thick to allow compression by the ischio-cavernosus muscle. He believed that the ischio-cavernosus acted by dragging the penis backwards, or, through the independent action of the muscles of one side, by pulling the penis to one side or the other during the act of copulation. However, the ischiac attachment is almost certainly too small for such an action as this. The immense mass of muscle confined almost entirely to the face of the corpus cavernosum can only have a compressor action.

The bulbo-cavernosus muscle lies between the arms of the cavernous crura (Figs. 1 l^{10}, 2 *i*, 3 *i*) immediately ventral and posterior to the "transverse ligament", with the fibres of which the deeper fasciculi of the muscle intermingle. The bulbo-cavernosus is overlaid in ventral view by the two retractores penis and posteriorly abuts upon the levator ani. The fasciculi arise from the inner ventral surfaces of the posterior portions of the arms of the crura and are inserted, after a short inward and backward course, upon a median fibrous raphe. The muscle must act by approximating the two arms of the crura, thus assisting in the erection of the penis.

The prostata

The part of the urethra extending from the termination of the corpus spongiosum at the base of the bulbus penis forward to the verumontanum, where the vasa deferentia join the urinary canal, has been named the prostate portion of the urethra (Fig. 3 *l*). In the foetus, 1·23 m. in length, this part of the urino-genital canal measured 2·0 cm. and had a cross-section of 1·3 cm. That is to say the prostata was somewhat less than a quarter as long as the part of the urethra within the corpus spongiosum. The prostate part of the urethra has an antero-posterior course and inclines slightly ventralwards towards its anterior extremity. The urethral canal widens very considerably in the prostatic part of its course; but a ridge, rising up from the dorsal wall of the canal and increasing in height from behind forwards (Figs. 3, 5, 6), converts the cross-section of the lumen into a crescent with dorsally directed horns (Fig. 5). Very numerous racemose glands open into the grooves formed by the horns of this crescent and less abundantly upon the surface of the ridge itself. The ridge is reinforced by a septum of longitudinal smooth muscles (Fig. 5) which are pronounced and strongly developed anteriorly but less so posteriorly.

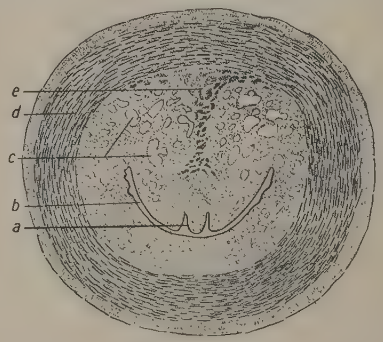

Fig. 5. Transverse section across the prostata of a 1·23 m. Fin whale foetus at the seminal pores. (× 4.)

a. Seminal pores.
b. Urino-genital canal.
c. Glandulae urethrales.
d. Compressor prostatae muscle.
e. Unstriped muscles of the glands.

Dorsally within the substance of the ridge the smooth muscles spread out to form a semicircular layer of longitudinal fibres underneath the fibrous investment of the canal.

The prostata is surrounded throughout its length by a thick layer of circular striated muscles—musculi urethrales—running within the fibrous urethral wall (Figs. 3 *m*, 4 *i*, 5 *d*).

The form of the prostate is one of the most remarkable features of the male urino-genital system of the Cetacea and constitutes one of the chief reasons for regarding the system as extremely primitive in organization. Weber (1904) gives a comparative account of the arrangement of the prostate glands among the Mammalia. In the most primitive forms there is no prostate gland in the strict sense, but an assemblage of racemose urethral glands opening diffusely along the length of the proximal part of the urino-genital canal. These are covered by a layer of striated urethral muscles. In Monotremes these glands have a ring-like arrangement in the neighbourhood of the vasa deferentia. In Marsupials the glandulae urethrales surround the whole length of this part of the urethra (pars pelvica) and form a thick layer, imparting a spindle shape to this part of the canal, which is known as the "prostata". In *Perameles* and *Phascolarctos* the glandulae urethrales extend dorsally, leaving the distal part of the pars pelvica free, surrounded only by the striated musculus urethralis, which is derived from the sphincter cloacae and thus belongs to the skeletal musculature. In the Cetacea this muscle surrounds the mantle of the urethral glands themselves and thus becomes a compressor prostatae. The arrangement of the glands in the Cetacea is much as in Marsupials, with layers of smooth muscle among the glands themselves under the compressor prostatae. In higher mammals the glands occur outside the smooth muscles, the fibres of which penetrate between the glandular acini, and outside the musculi urethrales, so as to form glandular bodies with separate openings on the colliculus seminalis or its neighbourhood. In these, according to Weber, it is possible to speak of a true prostate: as in the horse where two glandular bodies exist, joined by an isthmus, or in the Primates where the prostate has the form of a single compact mass. Thus the glands of the Monotremes, Marsupials and Cetacea must be said to represent the primitive condition in which the canalis urogenitalis is surrounded by diffuse urethral glands unlocalized to form a prostate.

The verumontanum

At the extreme anterior end of the prostate the dorsal ridge forms a collar-like swelling—the colliculus seminalis or verumontanum (Figs. 3 *n*, 6)—upon which the urinary canal opens by a small pore (Figs. 3 *q*, 6 *c*) and the vasa deferentia by a pair of small apertures immediately behind the urinary opening (Figs. 3 *n*, 5 *a*, 6 *d*). At the verumontanum the crescent-shaped prostatic part of the canalis urogenitalis terminates, ending in two antero-dorsally directed blind angles one on each side of the swollen colliculus (Fig. 6 *b*).

The bladder will receive further consideration when the urinary system is described. Its cavity narrows to a thick-walled urinary canal which opens by the small pore above mentioned situated on the verumontanum. When the urinary passage is opened it is seen that its longitudinally folded walls become smooth towards the opening into the prostate. It narrows to the calibre of a bristle and shows a single pronounced ridge projecting dorsally into the lumen (Figs. 3 *q*, 6 *c*). This ridge is independent of those which line the passage of the vesicular part of the urinary duct. It rises up alone from the smooth wall of the urinary passage and terminates in a small tooth-like fibrous projection which fills the urinary pore so that a bristle cannot be inserted into the passage from the prostate. This tooth-like projection, the crista urethrae, appears to fulfil the function of a valve, closing the entrance to the urinary duct and possibly preventing contamination of the semen with urine during coition. Daudt (1898, p. 294) described three such cristae, two lateral and one dorsal, of which the dorsal one was the largest. Only one was found in the present work and Yves Delage (1885, p. 121) found only one little transverse fold of mucosa. Immediately behind and slightly lateral to the urinary pore is a pair of minute crescentic openings (Fig. 6 *d*) upon the surface of the verumontanum. The openings are just wide enough to admit a bristle, and are the seminal pores through which the vasa deferentia open into the prostate.

Cowper's glands are lacking in the Cetacea and there are no anal glands.

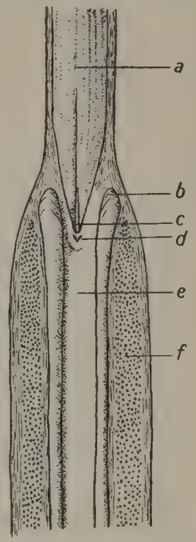

Fig. 6. Horizontal section of the Prostata and lower part of the urinary canal in a 1·23 m. Fin whale foetus. Ventral view. (× 2.)

- *a*. Urinary canal.
- *b*. Blind latero-dorsal terminations of the prostatic portion of the urethra.
- *c*. Urinary pore and crista urethrae.
- *d*. Seminal pores.
- *e*. Dorsal ridge of the prostatic part of urethra.
- *f*. Compressor prostatae muscle.

The uterus masculinus

No trace whatever of the uterus masculinus or sinus pocularis was found in either of the foetuses examined.

This is surprising in view of the fact that previous authors, with the exception of Yves Delage (1885) and Meek (1918), have found traces of the uterus masculinus. Delage carried out a large-scale dissection of an adult male *Balaenoptera musculus* (now *physalus*), and described the verumontanum and openings of the vasa deferentia in considerable detail. It seems unlikely that a sinus pocularis could have been missed in material so large. This author emphatically denied its existence. Daudt (1898, p. 295), however, in the same species, described a small sac which he took to represent the uterus masculinus. "The dorsal part of the wall of the neck of the bladder, towards which the folds are seen to converge, is itself somewhat swollen and immediately behind this highest point a little pit sinks into the prostate wall...the little pit corresponds to the vesicula prostatica" (uterus masculinus). Beauregard and Boulart also found a similar pit. Meek (1918) found no trace of a uterus masculinus in *Delphinus delphis*—he saw only a single crescent-shaped aperture on the verumontanum leading into the separate seminal ducts, which are separated at their terminations by a septum. Anthony, however (1922), found traces of a uterus masculinus in this species in the form of a pair of small ducts bordering the vasa deferentia near the testes.

The uterus masculinus or sinus pocularis represents the vestiges in the male of the Müllerian ducts and has been given a variety of different names. It finds its fullest development, according to Weber (1904), in the Rodents, Ungulates and some Carnivores, where it has the form of a central canal between the vasa deferentia ending in two lateral horns. In this condition it resembles the uterus bicornis of the female and may correctly be called a uterus masculinus. In the narwhal (Owen, 1868, vol. III) and in many Ungulates (the horse, the donkey and the zebra) the Müllerian system is represented by a caecum between the vasa deferentia bifid at its extremity. Weber gives to this condition the term vagina masculina. In Primates, many Carnivores and Insectivores it presents the condition described for *Balaenoptera* by Daudt—a small unpaired cavity surrounded by the prostate gland. In this condition Weber gives the structure the terms sinus pocularis, sinus prostaticus or vesicula prostatica.

Among the Cetacea in general the Müllerian system in the male appears to represent a considerable variety of conditions. In describing the verumontanum of *Kogia breviceps*, Benham (1901) says: "the pores (of the vasa) are quite below the general level of the mucous membrane and between them is a very slight recess in the substance of the urethral wall which no doubt represents the uterus masculinus". From this one may proceed to the condition described by Daudt and Beauregard and Boulart, already mentioned, in *Balaenoptera* and thence to that found by Meek in the porpoise (*Phocaena phocaena*). Here the uterus masculinus has the form of a single blind tube—a vagina masculina—lying between and behind the openings of the vasa deferentia. The single cavity in *Phocaena* may show two openings. In other Odontocetes the uterus masculinus was found by Owen (1868, vol. III) in the narwhal, where it was a vagina masculina—an elongated caecum opening behind the seminal pores—and by Meek (1918) in *Beluga* (now *Delphinapterus*) *leucas*, where it was stretched out into a flattened cavity. In the *Lagenorhynchus* described by Meek (an abnormal specimen) there was a short Müllerian duct on each side fusing medially into a sinus. In *Mesoplodon* the Müllerian system, according to Anthony (1922), reaches its greatest development among the Cetacea. There are two long Müllerian ducts which have the form of cords, with a narrow lumen terminating in a cul-de-sac at the extreme tip. The cords begin on each side at the posterior extremity and internal border of the testis, and pass along the wall of the vaginalis testis and thence accompany the vasa deferentia through the vagino-peritoneal canal, which exists in *Mesoplodon*. The two ducts join in the inter-deferential mesentery and form a cord passing between the two vasa. This cord has at first a large cavity which dwindles rapidly backwards and soon disappears. There is thus no opening of the uterus masculinus on the verumontanum. In *Delphinus delphis*—in which Meek found no uterus masculinus—Anthony found only the distal parts of the Müllerian ducts, the median or vaginal part being absent. This must be a secondary condition derived from that found in *Mesoplodon*, and it is conceivable that Meek may have overlooked these distal vestiges.

Thus, in the Cetacea, there is a great variety of conditions from complete absence of any trace of the Müllerian system, through stages of extreme reduction, as in *Kogia breviceps*, to the extreme development found in *Mesoplodon*.

In other mammals the uterus masculinus presents an appearance similar to that of *Mesoplodon*, most notably among the Rodents and Ungulates. The large prostatic utricle of the rabbit is of somewhat doubtful homology, but in the beaver there is a similar sac with two horns following the vasa deferentia. Among the Perissodactyle Ungulates the horse, donkey and zebra have a long vagina masculina which is bifid at its extremity. Among the Artiodactyles the goat and the reindeer have two long Müllerian ducts continuing to the epididymis as in *Mesoplodon*. The deer has a much reduced Müllerian system, the cavity of which is almost obliterated in the adult.

The testes

The testes retain their abdominal position throughout life and do not descend into a scrotum.

They are a pair of cylindrical bodies, slightly larger at their anterior extremities as observed by Beauregard and Boulart, lying in the abdominal cavity immediately behind the kidneys. On the left side of the body the testis lies against the hinder pole of the kidney; while on the right side, owing to the anterior position of the kidney on that side of the body, the testis is separated by a slight gap from the posterior extremity of the kidney. The testes lie with their axes converging slightly posteriorly. The anterior ends of the testes are embraced by the heads of the epididymides, which form on each testis a conical cap projecting forwards (Fig. 1 *c*); while the cauda epididymis lies along the lateral face of the testis enclosed within the same serous envelope. The caput epididymis is very intimately connected with the testis, and the vasa efferentia pass from the testis to the epididymis across the junction between the two bodies. The cauda, however, is connected with the testis along its length only by means of a narrow neck, so that a slit-like bursa testis of considerable depth lies dorsally between the testis and epididymis. The testis is attached to the lateral lining of the abdominal cavity by a mesentery, which runs forwards lateral to the kidney up towards the diaphragm as a plica diaphragmatica (Fig. 1 *b*). Behind the testes the mesenteries of the two sides form a common transverse ligament exactly comparable with the ligamentum latum of the female (Fig. 1 *g*). This ligament carries the vasa deferentia. Thus the attachments of the testes are exactly similar to those of the ovary in the female. This is the primitive form of gonad attachment among Mammalia—a posterior broad ligament and a plica diaphragmatica flanking the kidney on each side. A stout genital cord (Fig. 1 *i*), the mesorchiagos of Eschricht, runs from the posterior extremity of the testis itself, not of the cauda epididymis, to the posterior lateral angle of the inguinal part of the abdominal cavity. The insertions of these fibrous cords upon the abdominal wall are connected across the body cavity by a further transverse fibrous cord which runs immediately in front of the base of the penis. (In Fig. 1 this is shown severed to allow the walls of the abdomen to be pulled apart.)

In the foetus 1·23 m. in length both testes measured 2·9 × 0·8 × 0·7 cm.

In the foetus 2·65 m. in length the testes measured: right 7·5 × 1·2 × 1·4 cm.; left 7·5 × 1·2 × 1·1 cm.

In older whales the discrepancies between the measurements of the testes of the two sides become greater. The following is a selection from the measurements and weights of the testes of Fin whales measured at the whaling station during the season 1930–1. The lengths, breadths and depths are shown for testes of whales of various lengths.

Body length m.	Right testis				Left testis			
	Length cm.	Breadth cm.	Depth cm.	Weight kg.	Length cm.	Breadth cm.	Depth cm.	Weight kg.
16·5	23·0	6·5	3·0	—	18·0	8·0	4·0	
16·7	33·0	8·0	6·0	—	30·5	8·0	6·0	
18·75	65·0	25·0	12·0	16·0	57·0	27·0	11·0	15·0
19·42	49·0	17·0	9·0	14·0	45·0	17·0	9·5	12·0
20·2	81·0	22·5	15·0	24·0	71·0	24·0	13·0	20·0
20·4	61·0	23·0	12·0	—	55·0	27·0	13·0	
20·6	96·0	25·0	14·0	39·0	94·0	27·0	19·0	
21·7	79·0	25·5	12·0	—	71·0	26·0	12·0	

It is seen from the above that there is great variation in the size of the testis in whales of the same length, and that in any individual the right testis is longer than the left but not so wide. From the routine measurements of a great number of testes it is clear that the organ increases in size fairly evenly with the growth of the body up to sexual maturity, when the testis enlarges very greatly. After sexual maturity has been reached there is no correlation between the body length and the size of the testis. This is illustrated in the above table, since the testis of a whale 21·7 m. in length is smaller than that of the 20·6 m. individual and almost the same size as that of the 20·2 m. whale.

The growth and histology of the testis has been dealt with in detail by Mackintosh and Wheeler (1929, pp. 407–12) and the minute anatomy of the organ of *Neomeris phocaenoides* by Chi Ping (1926). In the Fin whale, as in *Neomeris*, the lobules of the testis substance occupy the whole space enclosed by the tunica albuginea and there is no mediastinum testis. In the antero-dorsal region of the testis there is a thickening of the septal membranes through which the vasa efferentia pass to the caput epididymis. The vasa efferentia are few in number, and after numerous sinuosities in the caput, join together to form a single much convoluted duct forming the cauda epididymis.

The whole testis and epididymis are enclosed together in the reduplication of the peritoneum forming the suspensory ligament of the testis and the ligamentum latum. Anthony detected radiating muscle fibres in the mesentery which he supposed were the vestiges of a cremaster muscle, but no trace of these was found in the Fin whale. There is no vaginal cavity surrounding the testis, since, as in *Neomeris*, the tunica vaginalis and the tunica albuginea are adherent to one another. In *Mesoplodon* there is a vaginal cavity between the two investments and a prolongation of this cavity penetrates as a blind caecum between the epididymis and the testis. In *Mesoplodon* the testis lies in an inguinal cavity resembling a cremaster sac.

The vasa deferentia

The vasa deferentia (Fig. 1 *f*) lie within the fibrous ligamentum latum which is attached centrally along the proximal part of the dorsum of the neck of the bladder and laterally contributes to the genital cord (Fig. 1 *g*). The posterior border of the ligamentum latum thus forms an arc between the neck of the bladder and the genital cord, through which the ureter emerges from its peritoneal coverings and passes upwards and forwards on to the neck of the bladder. The anterior border of the ligamentum is thicker than the posterior, and carries the vasa deferentia throughout the proximal part of their course.

The vasa deferentia are a pair of small sacculated ducts lined by a much folded columnar epithelium and surrounded by a thick fibrous investment containing blood vessels. In sections taken from the middle of the course of the foetal ducts no muscular tissue was seen. After leaving the cauda epididymis, which consists only of an abundantly convoluted duct continuous with the vas deferens, each vas passes transversely in the anterior border of the ligamentum latum towards the middle line of the body. In the small foetus (1·23 m.) this part of the course of the vas deferentia measured 2·5 cm. The ducts curve very slightly forwards during the transverse part of their course, and on reaching the middle line, turn abruptly backwards and run close together upon the neck of the bladder. On reaching the junction of the neck of the bladder with the prostate, the two ducts enter the fibrous wall of the urinary canal and converge inwards through it. In this part of their course they have no sacculations and are of exceedingly small calibre. They open as already described upon the verumontanum.

As appears to be the rule in the Cetacea no seminal vesicles were found upon the course of the vas deferentia. Daudt, however (p. 297), makes brief mention of structures which he calls "samenbereitenden Organe" lying against the epididymis. In *Mesoplodon* Anthony describes a small caecum on the testicular part of the course of the vas deferens projecting between the canal itself and the wall of the vaginalis. This, however, is probably not a reduced vesicula seminalis, owing to its proximity to the epididymis. Actually the figure that Anthony gives does not show the structure as a caecum at all, but as one of the convolutions of the vas deferens itself. Le Danois also described a diverticulum on the vas deferens of *Kogia* which he regarded as a reduced vesicula seminalis. This structure was also situated high up on the course of the vas deferens, far removed from the urethral region. In *Neomeris phocaenoides*, according to Chi Ping (1926), the lower ends of the vasa deferentia of the two sides converge in the middle line to form a single ductus ejaculatorius, and at their meeting point there is a median vesicula seminalis situated between them.

Discussion of the position of the testis

Before closing the description of the testis and its ducts a little further attention must be given to the abdominal position of the testis in the Cetacea—a condition commonly known as "testicondy". All authors—notably Weber, Anthony and Meek—have insisted that the testicondy of the Cetacea is secondary and that descent took place in the Cetacean ancestor.

Weber (1904), in his review of the question of the position of the testis among Mammalia generally, distinguished two kinds of testicondy.

(i) True testicondy. No inguinal canal exists and the ligamentum inguinale is lacking. The testis retains its primitive dorsal position in the neighbourhood of the kidney, slung by the "urinary ligament" which is a reduplication of the peritoneum and carries the early mesonephros (epididymis) and the vasa deferentia. This forms the plica diaphragmatica laterally. Such testicondy occurs in Monotremes, some Insectivores, the elephant and *Hyrax*. In some Edentates (Bradypodidae and Myrmecophagidae) the testes are pushed tailwards and lie between the bladder and the rectum. They are likewise suspended in a urinary ligament.

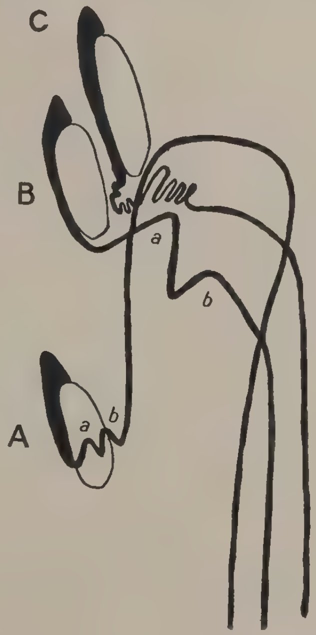

Fig. 7. Course of the vas deferens in: *A. Mesoplodon bidens* (after Anthony—1922). *B. Delphinus delphis* (after Anthony—1922). *C. Balaenoptera physalus*. (Major sinuosities only.)

a and *b*, Bends in the duct of *Mesoplodon* and *Delphinus* believed by Anthony to be homologous.

(ii) False testicondy. Here the ancestral descent has been secondarily abandoned and the testes lie in the abdominal cavity but have lost their former dorsal position and now lie ventrally. The inguinal canal is reduced in varying degrees and only indicated at most. This condition is seen best expressed in the Dasypodidae, where the testes lie against the ventral body wall. Except in *Chlamydophorus*, a wide inguinal ring exists, through which projects a small cremaster sac. Weber assigns the Cetacea to this class.

The arguments in favour of placing the Cetacea among the secondarily testicondal animals are based chiefly upon the ventral position of the testis and the existence of a genital cord attached to its posterior end. Anthony (1922) argues further in favour of secondary testicondy from the fact that in *Mesoplodon* each testis is sunk in a recess of the abdominal cavity in the inguinal region, connected with the main abdominal cavity by a vagino-peritoneal canal. These recesses, Anthony believes, represent the vestiges of the cremaster sac. The same author also found muscle fibres arranged fan-wise in the testis ligament which he took to represent the vestiges of the cremaster muscle. The vas deferens in *Mesoplodon* (Fig. 7 *A*), after a convoluted part upon the testis takes a straight course forward through the vagino-peritoneal canal and then bends round towards the middle line on to the neck of the bladder. In *Delphinus delphis* (Fig. 7 *B*), where the testis has the renal position, Anthony found an S-shaped bend shortly below the testis, which he identified with the convoluted portion of the vas deferens of *Mesoplodon*. From *Mesoplodon*, through *Delphinus delphis*, may be derived the condition found in *Balaenoptera*, which has been inserted for comparison into the figure (Fig. 7 *C*) given by Anthony for *Mesoplodon* and *Delphinus*.

With regard to this, however, Weber (1898, p. 60) says: "From knowledge of the relations in the Monotremes and various Insectivores we know that the windings of the vasa deferentia prove nothing in this respect".

The existence of a cremaster sac in *Mesoplodon* must be taken as undoubted evidence that some such sac, in which the testis was lodged, must have existed in the Cetacean ancestor; but, in the opinion of the present author, there is no evidence that full descent took place, although the present ventral position of the Cetacean testis is certainly not its primitive one so that partial descent at least must have occurred. Attention is drawn, however, to the extremely primitive arrangement of the testicular attachments. In the Cetacea, as in the Mammals listed by Weber as showing true testicondy, the testis with the epididymis is enclosed in a reduplicature of the peritoneum, attached to the dorsum of the neck of the bladder and forming a plica diaphragmatica laterally. The genital glands, as has already been remarked, are suspended in the most primitive mammalian way, and the method of suspension is almost identical in both sexes. This constitutes, in the opinion of the present author, one of the most important features of the male Cetacean genital system. It indicates a very early origin of the group possibly from some forerunner in which the testis, as in the ox embryo of 22·5 cm. mentioned by Weber (1898, p. 56), lay outside a small cremaster sac. In the ox embryo the testis lies at first within the abdominal cavity outside the inguinal ring before descending into the cremaster sac, and it is suspended in the Cetacean manner. In the adult complete descent into a scrotum takes place.

The vascular supply

The vascular supply in the genital region of *Balaenoptera musculus* has been described in some detail by Bouvier (1889, p. 103), and also by Beauregard and Boulart, who paid special attention to the vessels supplying the testis and epididymis. Murie (1873) also described the genital blood supply in *Globicephala*.

In the present investigation the blood vessels were not injected and thus the course of the major vessels only can be described. In actual fact there is such an inextricable network of small vessels in this region that only the broadest outlines of their disposition could be given in any account.

Rapp (1837) considered that the iliac arteries do not exist in the Cetacea. Daudt, however, calls the two lateral postcaval trunks, which join to a common postcava in the region of the kidney, the venae iliacae. The arteries actually identifiable with the common iliacs are very short and come off from the dorsal aorta, right and left,

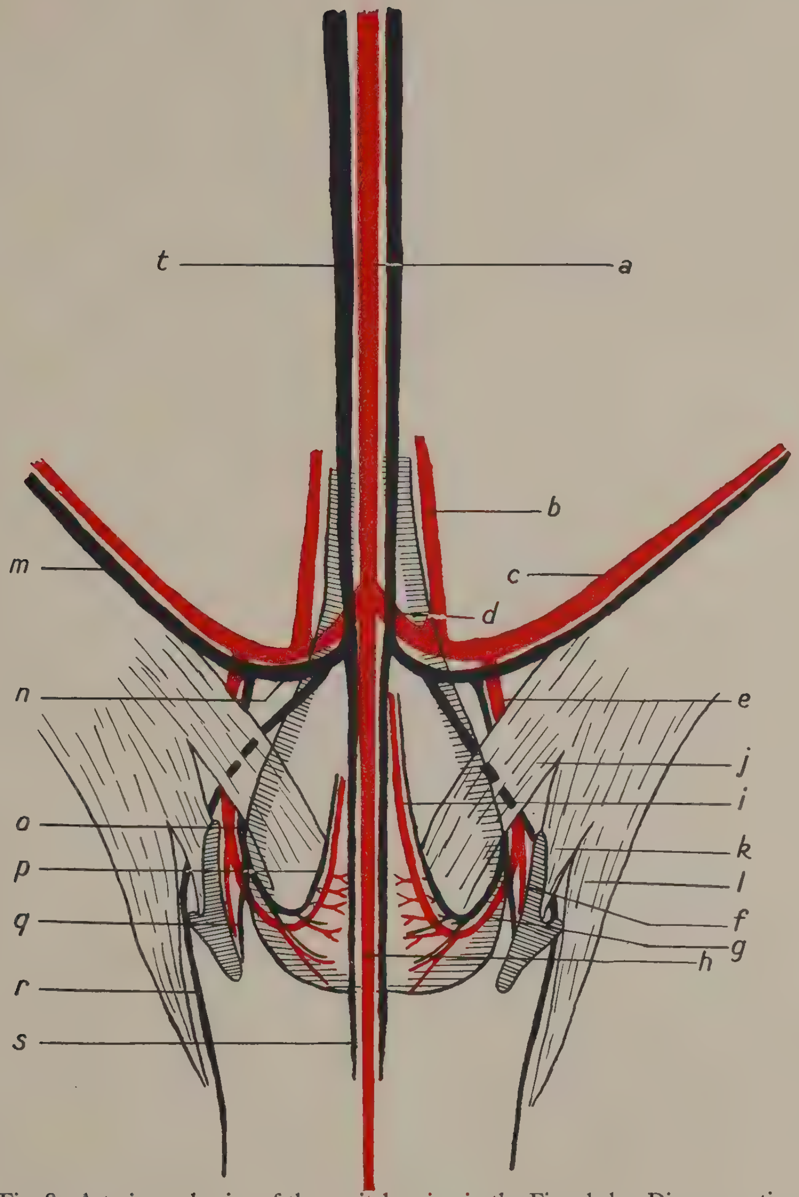

Fig. 8. Arteries and veins of the genital region in the Fin whale. Diagrammatic.

a. Dorsal aorta.	*k*. Iliac attachment of rectus abdominis muscle.
b. Hypogastric artery.	*l*. Superficial attachment of ditto.
c. Epigastric artery.	*m*. Epigastric vein.
d. Common iliac artery.	*n*. Common iliac vein.
e. Genital artery.	*o*. Genital vein.
f. Artery to pelvic musculature (external iliac of Murie).	*p*. Pudic vein.
g. Internal iliac of Murie.	*q*. Vein from pelvic musculature (external iliac of Murie).
h. Caudal artery.	*r*. Lumbar vein.
i. Pudic artery.	*s*. Caudal vein.
j. Caudal attachment of rectus abdominis muscle.	*t*. Postcava.

immediately dorsal to the neck of the bladder (Fig. 8 *d*). Just lateral to the neck of the bladder, after a very short and straight course, each common iliac artery divides into two branches. The anterior branch is the hypogastric artery. This passes on to the neck of the bladder, giving off some short rami to the bladder wall, and ascends to the summit of the urinary bladder, where it becomes enclosed in a thick muscular sheath, and with its homologue of the opposite side, forms the umbilical artery in this region (Fig. 8 *b*). The other branch from the common iliac on each side runs outwards and forwards over the floor of the abdominal cavity as the deep epigastric artery (Fig. 8 *c*). Each deep epigastric ramifies among the ventral abdominal muscles and anastomoses with the internal mammary system at its posterior termination. On their course the epigastrics come into close relation with the attachments of the genital cords to the abdominal parietes. They do not, however, pass through the vascular foramen of the rectus abdominis muscle, as described by Schulte (1916). They pass in front of and mesal to it. An artery leaves the epigastric on each side of the body and passes backwards through the foramen of the rectus (Fig. 8 *e*). Immediately within the foramen it splits into one or more branches to the pelvic musculature and a main pudic artery (Fig. 8 *f*, *g*). Murie (p. 269) believed that the trunk which shortly breaks up into small arteries to the pelvic musculature represents the external iliac artery, and that the trunk which gives off the pudic artery and the arteries to the cavernous crura represents the internal iliacs. The pudic artery passes on to the bulbus penis, crossing the mass of the ischio-cavernosus muscle, and runs along the posterior face of the penis, with its homologue of the opposite side, to the terminal cone. At the base of the bulbus the pudic arteries give off a plexus of small branches to the cavernous crura (Fig. 8 *g*).

The spermatic arteries come off from the dorsal aorta in the region of the inferior mesenteric at the level of the testis and lower pole of the kidney. They form a complicated fine network within the coverings of the testis and epididymis. They have been studied in detail by Beauregard and Boulart, who found that the most voluminous arteries enter the testis at its posterior extremity. Others serve the tail of the epididymis and the origin of the vas deferens. Others reach the epididymis at the union of the tail and head.

With regard to the veins of the genital region a pudic vein (Fig. 8 *p*) accompanies the corresponding artery along the posterior face of the penis, and after crossing the bulbus in a manner similar to the artery, receives a plexus of small veins from the cavernous crura. This vein is joined by others from the pelvic musculature and runs inwards through the vascular foramen of the rectus abdominis muscle (Fig. 8 *o*) to join the deep epigastric vein accompanying the artery of that name. Together they form an iliac trunk joining the post-caval trunk of that side of the body. Large lumbar veins from the lateral superficies of the lumbar and caudal region (Figs. 1 k^3, 12 k^3, 8 *r*) run inwards under the attachments of the ischio-caudalis muscle to the ischium on each side and join the iliac veins. There are small arteries with corresponding veins from the iliacs to the prostate and the neck of the bladder.

The arrangement of the blood vessels in the inguinal region is much obscured by a great arterial and venous vascular plexus which fills the posterior angles of the abdominal cavity on each side of the genital tract. This plexus was described by Bouvier (1892) for *Hyperoödon rostratus*. In that species and in the *Balaenoptera* foetuses dissected during this work the plexus in this region is extremely diffuse and extends throughout the dorsal parietes of the abdominal cavity as far forward as the level of the testis, where it receives contributions from the spermatic arteries and veins. The arterial elements of the plexus are derived from all the surrounding arteries, and the venous constituents similarly drain into all the venous channels of the region—that is iliac, epigastric and pudic arteries and veins and the lumbar vein. In each of the foetuses examined in the present work at least one large venous trunk was found running through the mass of the inguinal venous plexus and draining into the iliac, lumbar or post-caval veins (Figs. 1 k^2, 12 k^2). The thickest part of this network lies immediately within the pelvic bone. It is in very intimate relation with the two large lymph glands which occupy a large part of the inguinal portion of the abdominal cavity (Figs. 1 *m*, 12 *i*). One of these lies against the prostate and is compactly oval in outline, the other is more diffuse and lies against the proximal part of the epigastric artery and vein. They are both surrounded and embedded in the diffuse vascular mass. This mass of anastomosing blood channels is not so dense nor so definite in outline as the thoracic and basicranial "retia mirabilia". It continues up the middle line of the body under the spinal column in connection with the central lymph tract that occupies that area.

Beauregard and Boulart found that the veins draining the testis are much larger than the corresponding arteries and may be separated into two groups. One group comprises all the veins of the testis and epididymis and is much the more important of the two. This group lies at the posterior end of the testis above the cauda epididymis and the origin of the vas deferens. It results from the union of three posteriorly situated plexuses and two anterior plexuses. The latter are situated on the head of the epididymis and are connected with the posterior ones by a large vein running along the testis dorsally. The other group of spermatic veins contains only those coming from the lower part of the epididymis. This group is situated outside the serous fold of the testis and epididymis.

THE FEMALE GENITAL SYSTEM

EXTERNAL

In the female sex the external genitalia (Plate II, fig. 2; Plate III, fig. 1) are also contained in a genital slit to which, since it constitutes the only common urinogenital part of the system, the name "vulva" must be applied. The vulva in the female, however, is of much greater extent than the genital slit or penis sac of the male, and in the adult female at time of heat it gapes open so as to become oval in form, exposing the structures within (Plate III, fig. 2). The vulva terminates posteriorly as a forked groove, a triangular prominence, on which the anus is situated, lying between the prongs of the fork. Mackintosh and Wheeler (1929, p. 324) have shown that the distance between the centre of the vulva and the anus in the female is much less than that between the penis sac and the anus in the male. It amounts to only 3 per cent of the total body length as against 7 per cent in the male sex. In the 2·1 m. foetus dissected in the present work, the distance between the centre of the anus and the centre of the vulva amounted to 5·75 cm.

In toothed whales and the Balaenidae the anus lies within the hinder commissure of the vulva and is surrounded by the same sphincter. In view of this fact some doubt may be expressed whether the large fleshy lips that flank the vulva both in Mysticetes and toothed whales should correctly be called the labia majora. All previous authors, however, have given this name to the lips of the vulva of *Balaenoptera*. Anteriorly they converge in front of the clitoris, to form, as stated by Beauregard and Boulart, a long deep fold running forwards in the middle line (Plate III, figs. 1–3; Fig. 10). No sign was found in the foetus dissected, nor in any adult, of any anterior rounded elevation such as Turner (1870 *a*) found and identified with the mons veneris.

A number of accessory grooves flank the vulva. The number and extent of these grooves varies in different individuals, but two pairs of them are always present and are constant in position. The mammary grooves form one of these pairs (Plate II, fig. 2; Plate III, figs. 1–2; Fig. 10 *d*). They contain the nipples and lie close to the labia majora on each side. In the 2·1 m. foetus the middle point of the mammary groove, where the nipple was situated, lay opposite the clitoris, 1·6 cm. from the centre of the vulva. The other pair of grooves lies farther laterally (Plate III, figs. 2, 3; Fig. 10 *e*), one member of the pair on each side of the vulva. The grooves of this pair are very long and exhibit an anterior deep portion (Plate III, fig. 2) opposite the extreme anterior termination of the labia majora. In the 2·1 metre foetus the centres of these anterior grooves lay 1·25 cm. on either side of the middle line. The posterior continuations of these grooves lie lateral to the nipples (in the foetus 2·1 m. in length the posterior grooves were 2·25 cm. on either side of the median line of the vulva). Between these two extremities the middle portion of the groove is shallow and less clearly visible. Other grooves are found flanking the vulva in the adult and they vary very greatly in number and position. Mackintosh and Wheeler (1929, p. 58, Fig. 98) give an illustration of the maximum and minimum development of the genital grooves which is here reproduced (Fig. 9). In the upper illustration, which shows their minimum development, it is seen that only one pair of accessory grooves is present besides the mammary grooves. In the lower illustration the maximum development is

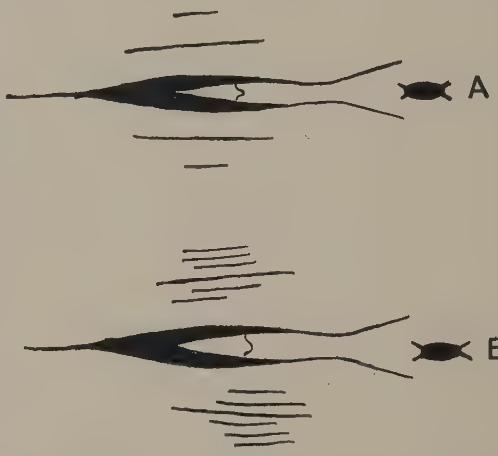

Fig. 9. Maximum and minimum development of accessory genital grooves in the adult female Fin whale. (From Mackintosh and Wheeler, 1929, Fig. 98.)

A. Minimum development.
B. Maximum development.

shown. In the foetus never more than the two pairs above described are seen—the mammary grooves and one other pair lying outside the mammary grooves.

The genital aperture (Plate III, fig. 2 *d*) is wide and funnel-shaped. It occupies the centre of the vulva and its sides are beset with radiating folds of skin. The urinary opening is small (Plate III, fig. 2 *e*) and lies under the curve of the finger-like clitoris at the extreme anterior end of the vulva. In the foetus the arrangement of the two apertures was such that the urinary opening could be regarded as situated within the genital aperture, on the anterior wall of it, rather than as forming a separate opening in front of the genital aperture. Thus in the foetus it was really possible to speak of a short urino-genital vestibule. In the adult, however, a fleshy corrugated pad (Plate III, fig. 2 *f*) develops between the two apertures and their relationship changes somewhat, so that the urinary aperture becomes more definitely separated from the genital and comes to lie in front of it.

This separation of the genital and urinary passages throughout the whole of their length is a primitive feature, of importance in the anatomy of the female urino-genital system of the Cetacea. It is found, according to Weber (1904, p. 253), in some Insectivores (*Talpa* and *Sorex*), some Prosimiae and, most frequently, in Rodents. Complete separation of the genital and urinary canals takes place in these cases, so that the genital aperture is used only at parturition and coition. In the Rodents, such as the Porcupine and *Pedetes*, in which this condition occurs, the urinary canal is enclosed by two overlapping folds of the clitoric prepuce which meet ventral to the clitoris and enclose a groove through which the urine is voided to the exterior. In the mole the vagina is closed early in life (Owen, 1868, vol. III, p. 688) and only the urinary opening is visible from the exterior immediately behind the clitoris. The condition found in the Cetacea is probably derived from one in which, ancestrally, a very short urinary duct existed, such as is found in many Insectivora such as *Tupaia*. It has possibly arisen as a result of the outgrowth of the fleshy pad between the two openings.

Within the vulva the most prominent organ is the clitoris (Plate III, fig. 2 *a*), of which Beauregard and Boulart (1882, p. 180) gave an exact description. The clitoris is embraced by two folds of skin (Plate III, figs. 2 *c*, 3). They commence in front of the urinary opening and run outwards and forwards on each side of the clitoris, converging to lose themselves anteriorly in the forward extremities of the labia majora (Plate III, fig. 2 *c*). They represent the labia minora. In the closed condition of the adult vulva the clitoris projects upwards and backwards across the urinary aperture into the genital opening; but in the extended condition of the vulva it protrudes outwards and backwards and does not cover the urinary opening. In the foetus the clitoris was a single curved keel-like prominence, triangular in cross-section. Distally it had the form of a tightly-curved finger upon the anterior angle of the vulva with its tip pointing upwards into the vulva (Fig. 11 *l*). In the adult, however, the clitoris is much shorter relative to its breadth. It has the form of a median finger-like projection emerging at the anterior end of the vulva from between the labia minora. In front of the clitoris a fold of skin (Plate III, fig. 3 *a*), described by Beauregard and Boulart (1882, p. 180) and Meek (1918), and held by them to represent the praeputium, "covers the clitoris up to about half its height and forms a sort of lip for it, which, running round the lateral faces, loses itself behind in the labia minora". There is frequently a number of fleshy tags around the base of the clitoris in the adult, and the development of the fleshy pad between the urinary and genital openings has already been mentioned. The sides of the genital opening are also thrown into abundant radiating rugae. All these fleshy protuberances would appear to have the function of retaining a firm grip on the smooth cylindrical penis during copulation.

Mackintosh and Wheeler (1929, pp. 381–2) described the structure known as the "vaginal band", which is frequently found in all species of *Balaenoptera* yet examined but is especially frequently seen in *B. physalus*. This structure stretches across the genital opening from the anterior fleshy pad to the posterior wall of the opening. As the "vaginal band" is an important and remarkable feature of the anatomy of the genital system a brief account of the structure will be given here. The "vaginal band" is a thick strand 7–8 cm. long and not less than 1·0 cm. in diameter in the adult. It stretches, as already mentioned, from the anterior fleshy pad in front of the genital opening to the posterior lip. In mature whales one end only of this band is usually found as a tag—the "vaginal tag"—5–6 cm. long, attached usually anteriorly, sometimes posteriorly. "The band is composed mainly of fibrous connective tissue with a few small blood vessels. Many minute convoluted ducts course through the tissue....Transverse sections show that the character of the band is not similar throughout. That part—about one-third—which faces the opening of the vagina is covered with papillae. At each side the papillae give place to a typical epidermis which covers the remaining two-thirds of the surface and resembles the epidermis covering the blubber. Sections give the impression that the outer surface epidermis has grown in round a solid strand of the underlying tissue but has not completely covered the inner surface" (Mackintosh and Wheeler, p. 381).

The complete vaginal band is not usually found in mature whales, since the act of coition cannot well take place without rupturing it. Only one instance is recorded in which coition had certainly taken place without rupture of the band. In this instance the whale was pregnant, but the vaginal band, though complete, did not stretch completely across the genital aperture since one end was attached somewhat at the side of it.

Thus the opening of the vagina in early life is closed by a hymen-like structure which is ruptured at coition. The occurrence of this structure is too frequent to allow the "vaginal band" to be looked upon as an abnormality, but in the opinion of the present author, it may be regarded as comparable with the hymen which stretches longitudinally across the vaginal opening of the mare. As already mentioned, the mole (Owen, 1868, vol. III, p. 688) has at first only a urinary aperture behind the clitoris and the genital aperture appears later by the rupture of the skin between the urinary opening and the anus.

THE MAMMARY GLANDS

The mammary glands are inguinal in position, one on each side of the vulva, the nipples lying in the mammary grooves as has already been described. According to Ryder (1885, p. 135) the nipples present the condition termed "pseudo-nipples" by Gegenbaur. The walls of the nipple fossa are raised up as a rim enclosing a cup-like pit in which the glands open. The glands themselves are tubulo-racemose and oval in outline, with their widest point about one-third of their length from their posterior ends in the adult, and about half their length in the foetus. The longest axes of the ovals make an acute angle with the middle line of the abdomen. The central duct of the gland receives secondary ducts laterally, and, near the nipples, swells out to form a thick-walled reservoir.

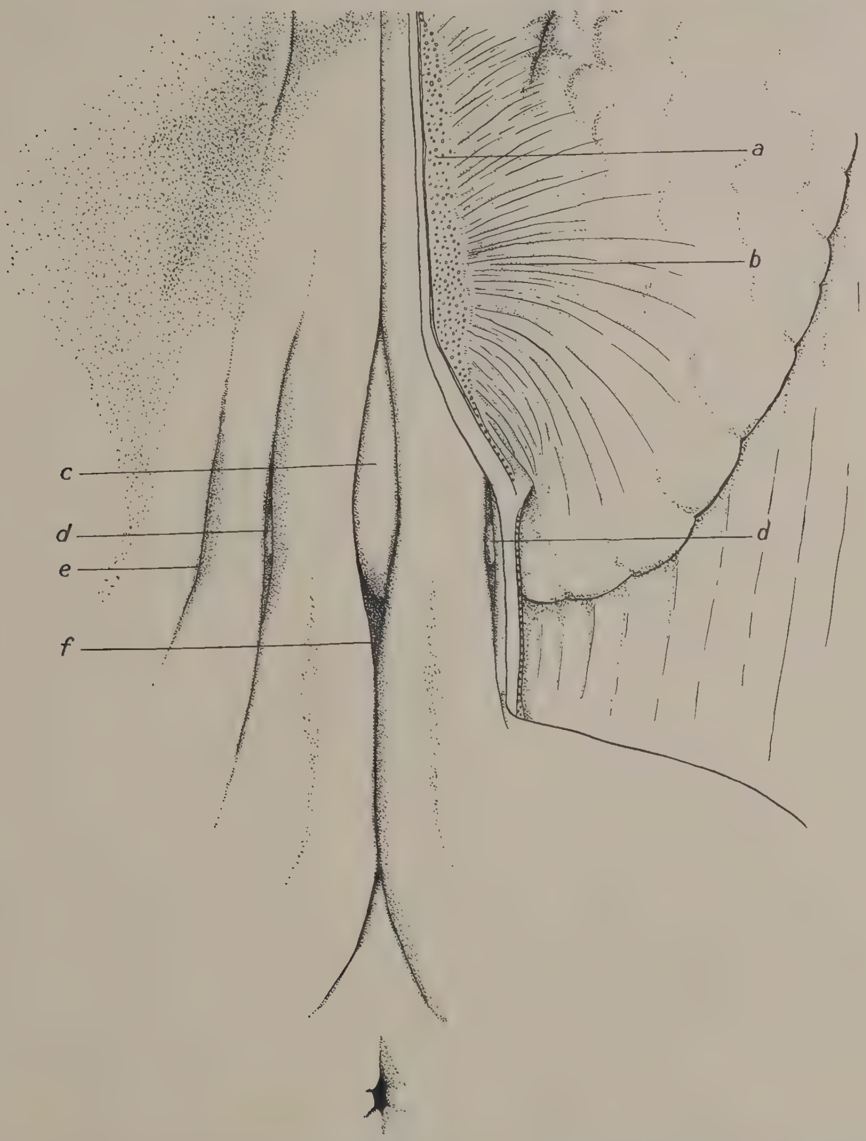

Fig. 10. External genitalia of a female Fin whale foetus 2·1 m. in length. The skin has been dissected away from one side to show the mammary gland and compressor mammae muscle. (× $\frac{3}{4}$.)

a. Panniculus carnosus.	*d*. Nipple in mammary groove.
b. Compressor mammae muscle.	*e*. Accessory groove.
c. Clitoris.	*f*. Vulva.

The mammary glands have been described in some detail by Lillie (1915) for the humpback (*Megaptera nodosa*) and further for Blue and Fin whales by Mackintosh and Wheeler (1929, pp. 401–5) and Heyerdahl (1930).

There is little to add to the descriptions of these authors. The glands on each side of the body and the nipples are embraced by a compressor mammae muscle (Fig. 10 *b*), derived from and directly continuous with the panniculus carnosus, which in the middle line between the two mammae is immensely thickened and strengthened, as will shortly be described. The lateral and deep fibres of this thickened part of the panniculus carnosus are concerned with the posterior extremity of the mammary gland and resolve themselves into two layers—one with fibres running superficial to the gland, and the other with fibres running dorsal to it between the mammary gland and the fascia covering the rectus abdominis muscle. The direction and superficial extent of these two layers appears to be the same. The posterior fibres pass outwards and backwards and are inserted upon the superficial fascia around the nipple. Farther forward the fibres pass outwards transversely to the axis of the gland, and anteriorly, where they are far less powerful, they are directed outwards and forwards from the middle line and are inserted nearer to the inner edge of the gland, which is now separated by a considerable distance from the middle line of the body on account of the oblique direction of the long axis of the glands (Fig. 10). It was not found, in the foetus examined, that the posterior fibres of the compressor mammae muscle both arose and were inserted, as Lillie described them, in proximity to the nipple itself.

In the foetus the gland has an oval form and is less elongated and broader in proportion to its length than in the adult. In the 2·1 m. foetus the mammary gland was 13·5 cm. in length, and at its widest point which lay half-way along its length, was 5·75 cm. wide.

The following are the measurements of the external genitalia of a female Fin whale foetus 2·1 m. in length:

Distance from the centre of the vulva to the centre of the anus	5·75	cm.
Distance from the base of the clitoris to the centre of the anus	11·5	„ (approx.)
Distance between the nipples	3·25	„
Distance between the posterior ends of the outer pair of grooves	4·75	„
Distance between the anterior ends of the outer pair of grooves	2·5	„
Length of the mammary glands	13·5	„
Greatest width	5·75	„

MUSCULATURE

The panniculus carnosus has the same direction and disposition as in the male sex, but in the middle line, immediately anterior to the genital region, it forms a relatively immense muscular mass—thicker than the similar mass in the male. The fibres of this mass anteriorly are directed outwards and forwards, and posteriorly outwards and backwards from a median raphe continuous with the linea alba. The deep latero-posterior fibres make up the compressor mammae muscle, while the superficial ones situated still more posteriorly are associated with fibres running forwards from the

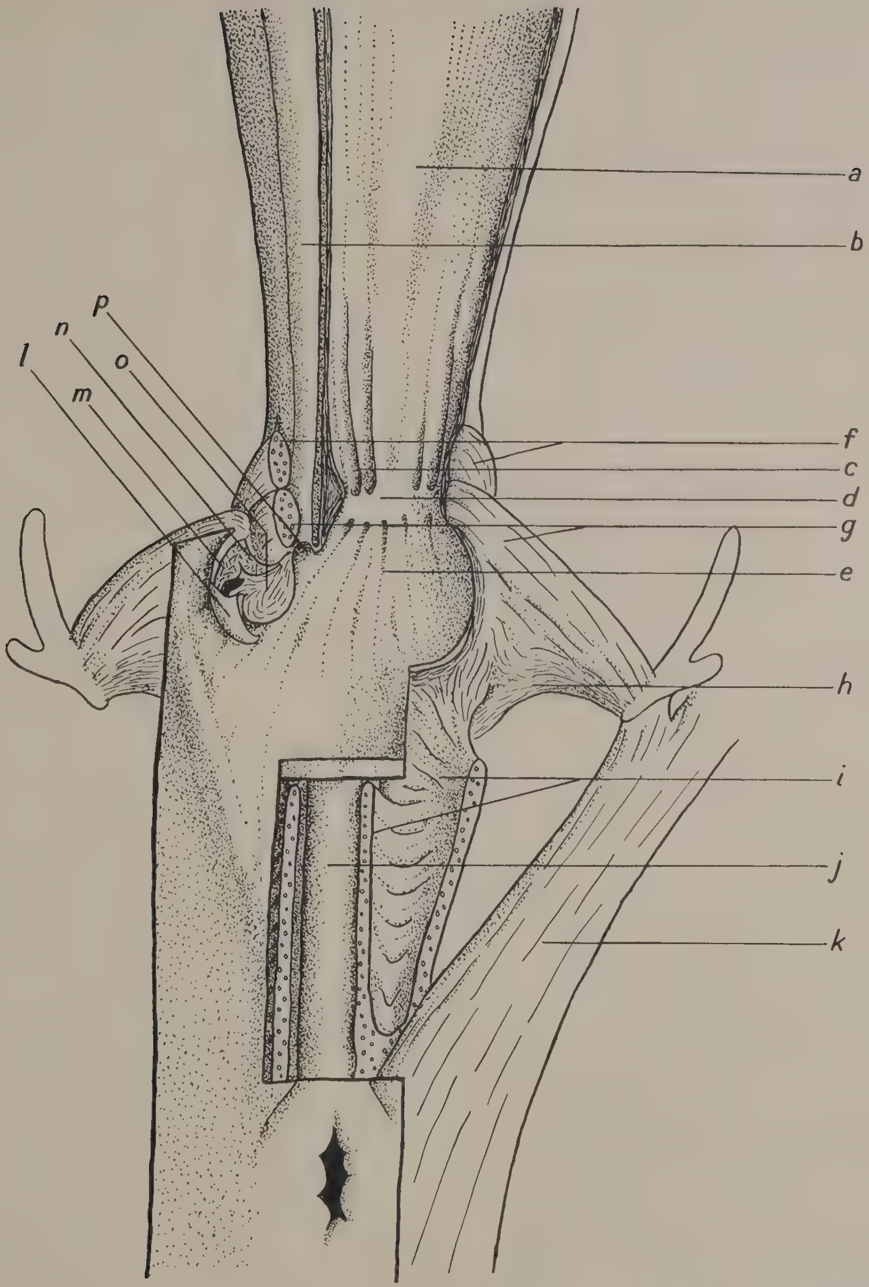

Fig. 11. Vagina and vulva of a 2·1 m. Fin whale foetus dissected to show the relation of the parts. The vagina has been opened along the mid-ventral line, and the clitoris, cut longitudinally, has been laid over on the right side of the vulva together with the urinary opening.

a. Vagina.
b. Urinary duct.
c. Grooves at the entrance to the vagina.
d. Constriction at the entrance to the vagina.
e. Vulva.
f. Sphincter vaginae muscle.
g. Ischio-cavernosus or erector clitoridis muscle.
h. Interpelvic ligament.
i. Levator ani muscle.
j. Rectum.
k. Ischio-caudalis muscle.
l. Clitoris.
m. Corpus cavernosum clitoridis.
n. Crus corpus cavernosi clitoridis.
o. Bulbus clitoridis.
p. Urinary aperture.

levator ani in the great fibrous mass at the sides of the vulva. There is a great muscular pad also, with fibres directed transversely, between the vulva and the anus. This thick transverse sheet consists largely of the levator ani muscle in its deeper part (Fig. 11). In front, immediately dorsal to the hinder lip of the vulva, the transverse mass of fibres incorporates the "interpelvic ligament" of Struthers, which is more developed in the female than in the male. A thick transverse sheet of fibres is thus formed, running dorsally between the labia majora, making a half sphincter round the posterior side of the vulvar opening (Fig. 11). As already mentioned, at the sides of the vulva are two large fibrous masses which receive fibres from the panniculus carnosus and the levator ani. Thus the labia majora can evidently be strongly drawn together, so as to compress the vulva.

In this connection one may recall that within its musculo-fibrous body the vulva narrows very rapidly, forming a funnel-shaped aperture with tough corrugated sides (Fig. 11 *e*). In the adult there is a hard fibrous pad with a corrugated surface bounding the genital opening anteriorly within the vulva. The sides and posterior face of the genital aperture are provided with the muscular and fibrous masses above referred to, the action of which is to constrict the opening. Immediately within the narrowest part of the funnel-like genital opening there is a circular constrictor muscle (Fig. 11 *f*) surrounding the lower limit of the vagina. This muscle is the sphincter vaginae and is homologous with the bulbo-cavernosus muscle of the male. It has been described by most previous authors, notably Meek (1918) and Murie (1873). Of this muscle in *Globicephala melaena* Murie wrote (p. 289): "It is attached to the vagina near the anterior end of the pelvic bone and, as a broad fleshy mass, encircles the generative canal beneath the mammary gland. Broadest in front it narrows behind and becomes inserted upon the strong median fascia posterior to the vulva." In *Balaenoptera* its arrangement seems to be the same as in *Globicephala*. Ventrally, beneath the vagina, the muscle is a strong sphincteric band; dorsally it thins out upon the vaginal wall and becomes incorporated with the fibrous masses already described in that position. It seems evident from the anatomy of the parts that the female takes a very active part in the act of coition and that the erected penis is very firmly gripped by the female. This process is carried out by means of the fibrous structures within the walls of the vulva and in the labia majora and of the sphincter vaginae muscle. The fleshy tags around the genital opening and the rugae on its walls prevent the vulva, already lubricated by the secretion of mucus, from slipping upon the smooth surface of the penis. The grip is probably maintained until the female orgasm is complete and the structures relax.

The description already given of the rectus abdominis, ischio-caudalis and hypaxial muscles of the male applies equally to these muscles in the female. The levator ani, however, is larger and more powerful in the female than in the male and takes part in the formation of the fibrous mass around the vulva.

The ischio-cavernosus or erector clitoridis muscles (Fig. 11 *g*) are a pair of stout bands arising from the ischial portions of the pelvic bones. In *Phocaena phocaena* Meek (1918) states that they arise along the whole length of the pelvic bones as in the male. The erector clitoridis muscle of each side passes obliquely inwards and forwards to become attached to the anterior aspect of the base of the clitoris, where it finds insertion upon the cavernous crura. The more superficial ventral fibres of these muscle bands do not reach the cavernous bodies, but meet one another in a median raphe upon the antero-ventral aspect of the clitoris (Fig. 11).

The "interpelvic ligament" forms a broad ligamentous tract behind and above the posterior lip of the vulva: it forms the substance of the posterior commissure of the vulva. Laterally on each side it arises from the ischiac portions of the pelvic bones confluently with the erector clitoridis muscles. The "interpelvic ligament" embraces a much larger tract of fibres than in the male; but this tract incorporates also the levator ani muscle and contributions from the panniculus carnosus.

INTERNAL ORGANS

The clitoris

The external form of the clitoris has already been described. In the foetus it was tightly incurved and finger-like and its tip projected over the urinary aperture. In the adult it projects outwards and backwards.

At the base of the clitoris there is a fibrous bulbus clitoridis carrying the crura of the corpus cavernosum (Fig. 11 *o*). The corpus cavernosum clitoridis has the Y-shaped crus that is observed in the male. The stem of the Y occupies the shaft of the clitoris, while the two arms of the crus project sharply upwards in the anterior part of the bulbus (Fig. 11 *n*). They have a forwardly curved course and taper sharply towards their upper forward extremities. Within the bulbus itself, the fibrous investments of the cavernous bodies are immediately continuous with the fibrous mass that makes up the substance of the bulbus. Traces of a spongy body were seen accompanying the cavernous body on its anterior and dorsal face. The pudic arteries, veins and nerves to the clitoris pass through the vascular foramen of the rectus abdominis muscle and over the anterior faces of the erector muscles near their insertions upon the clitoris (Fig. 12). Thence they pass to the tip of the organ in the same manner as the corresponding vessels and nerves in the male. They pass along the posterior face of the clitoris, which is directed towards the vulva. This face, therefore, although directed posteriorly, is homologous with the anterior face of the penis. The clitoris may therefore be compared with the penis turned back through 180°, so that its anterior end looks backwards and its tip upwards.

Meek, in the porpoise, found a strong tendon arising from the rectum and "passing forwards in a tunnel between the erector, the levator ani and the sphincter vaginae". This tendon expands into a muscle above the clitoris and "is inserted at the base of the praeputial pouch". This, the retractor clitoridis, was the homologue of the retractor penis of the male. It was not found, however, in the Fin whale, and no other author mentions it either in the porpoise or in any other species.

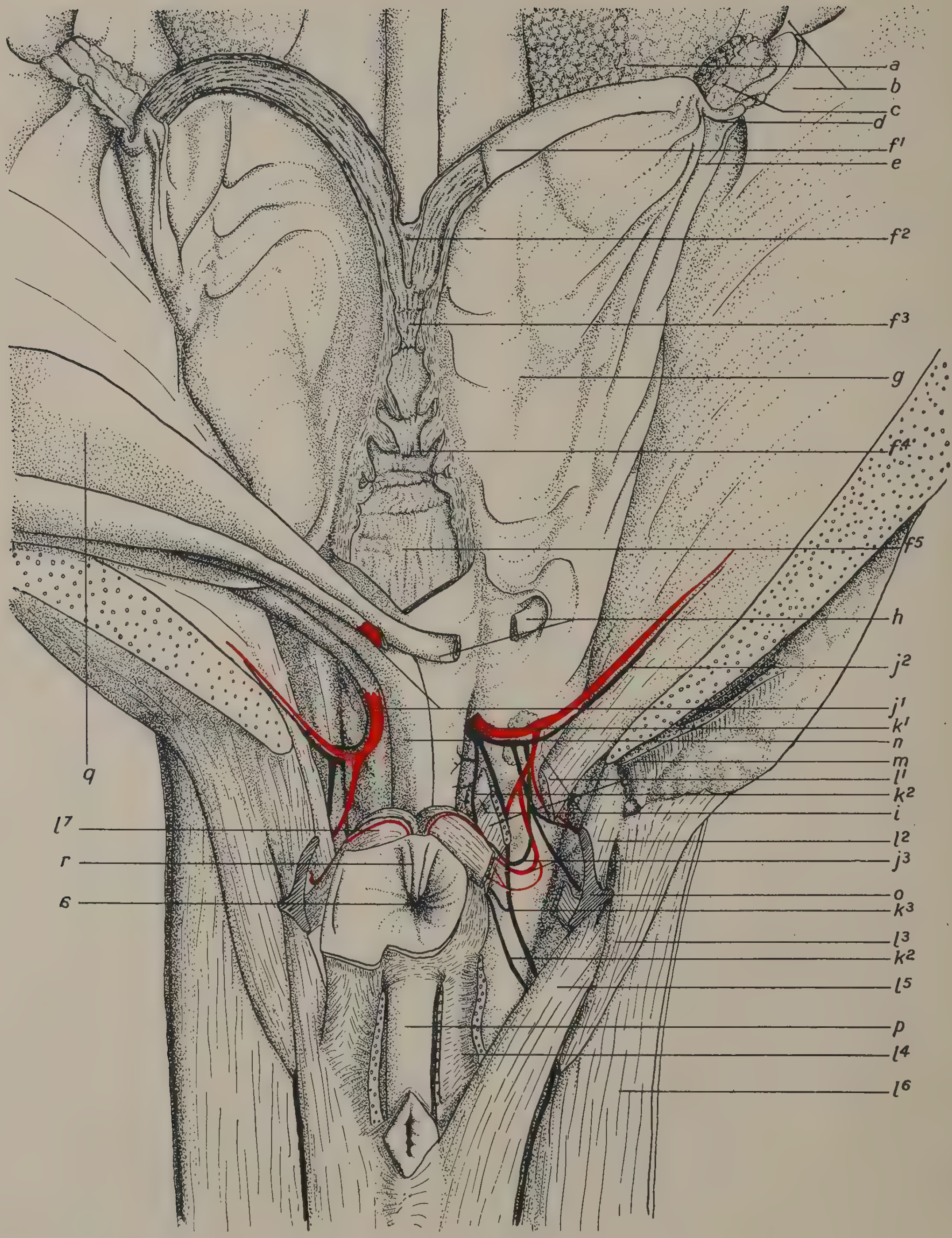
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Fig. 12.

The ovaries

The ovaries in the 2·1 m. foetus were compact bodies with flat bounding surfaces (Figs. 12, 13) marked by a great number of irregular grooves and sulci. They were nearly rectangular, but slightly curved along their ligamentous attachments and tending to taper posteriorly. The measurements (in cm.) of the ovaries in the 2·1 m. foetus were as follows:

	Length	Breadth	Depth
Right ovary	4·5	1·75	1·25
Left ovary	4·25	1·75	1·25

In adolescent whales the ovaries are rounded in outline and of greater length in comparison with their breadth. The superficial sulci increase greatly in number and have many smaller and smaller ramifications so as to produce a crinkled appearance termed "bramble marking" by Mackintosh and Wheeler (1929, p. 383). In whales approaching sexual maturity the sulci and "bramble markings" tend to disappear, but the surface becomes covered with rounded protuberances formed by ripening follicles, and later, in mature whales, by the hard knob-like corpora lutea. Mackintosh and Wheeler (1929, pp. 382–96) and Wheeler (1930) have dealt fully with the physiology of the ovaries.

The ovaries lie obliquely in the abdominal cavity (Fig. 12 *c*), their rostral extremities lying nearer to the middle line than their caudal. Their position is not quite symmetrical in the body cavity, since the left ovary lies slightly anterior to the right, and, owing to the more posterior position of the left kidney compared with that on the right side of the body, the left ovary with its ligaments covers a correspondingly greater portion of the

Fig. 12. Internal genitalia of a female Fin whale foetus 2·1 m. in length.

a. Kidney.
b. Plica diaphragmatica.
c. Ovary.
d. Oviduct.
e. Ligamentum teres uteri.
f^1. Uterine cornu.
f^2. Median backwardly projecting septum at union of cornua.
f^3. Corpus uteri.
f^4. Folds of vaginal wall.
f^5. Smooth walled part of vagina.
g. Ligamentum latum.
h. Ureter.
i. Inguinal lymph glands.
j^1. Hypogastric arteries.
j^2. Epigastric artery.
j^3. Pudic artery and vein.
k^1. Common iliac artery and vein.
k^2. Venous trunk running in the inguinal plexus.
k^3. Lumbar vein.
l^1. Caudal attachment of the rectus abdominis muscle.
l^2. Iliac attachment of the rectus abdominis muscle.
l^3. Superficial attachment of the rectus abdominis muscle.
l^4. Levator ani muscle.
l^5. Ischio-caudalis muscle.
l^6. Hypaxial muscle.
l^7. Ischio-cavernosus muscle (erector clitoridis).
m. Mammary gland and compressor mammae muscle.
n. Urinary duct.
o. Pelvic rudiment.
p. Rectum.
q. Bladder.
r. Clitoris.
s. Vulva.

left kidney. It lies upon it for about one-third of the length of the kidney from its posterior pole, while the right ovary lies over the hindmost extremity of the kidney of that side.

The broad ligament (ligamentum latum) is attached to the ovary along its median side, where there is a slit-like hilus, deepening posteriorly to admit the ovarian nerves and blood vessels.

The ligamentum latum

The broad ligaments and their attachments to the ovary and to the body wall have been described by Beauregard and Boulart (1882) and by Daudt (1898) for *Balaenoptera musculus* (now *physalus*), and by Schulte (1916) for *B. borealis*. In the Fin whale examined in this work close agreement was found with the account given by Daudt; but there were some differences.

The broad ligament forms a thick transverse sheet attached to the parietes laterally (Fig. 12 *g*). In its posterior part it embraces the vagina, corpus uteri and uterine cornua (Fig. 12 f^5, f^4, f^3, f^1), being attached ventrally to the two former so as to obscure their outline in ventral view. The ligaments of the two sides are continuous ventrally across the vagina and corpus uteri, but the line of attachment shifts on to the lateral faces of the cornua (Fig. 12 f^1). Anteriorly the ligament has attachment to the ovary and involves the coiled oviduct and the ostium abdominale (Fig. 12 *d*).

As described by Daudt a short strong band (Fig. 13 *f*) passes from the rostral end of the ovary on to the foremost end of the ostium abdominale, and a ridge of papillae, not mentioned by Daudt but described by Weber (1886) for *Hyperoödon*, passes continuous with the papillae within the ovarian funnel along this band towards the rostral pole of the ovary. Further, this band spreads out in a triangular manner (Fig. 13 *g*), so that one angle of the triangle is attached to the posterior pole of the ovary as a strong ligament, and the other is attached to the anterior face of the uterine cornu as a thin transparent sheet. From the posterior pole of the ovary a short transparent band (about 2·6 cm. long in the 2·1 m. foetus) runs dorsally on to the uterine cornu (Fig. 13 *h*). This band, according to Daudt, is the ligamentum ovarii, but that author describes it as passing on to the ventral face of the uterus. Daudt further described (p. 301) a transverse fold passing from the ovary to the oviduct; but this was not seen during the present work and Schulte did not find it in the foetal Sei whale examined by him. A strong fold runs outwards and backwards from the posterior pole of the ovary over the dorsal surface of the ligamentum latum (Fig. 13 *j*). It carries the blood vessels and nerves to the ovary and represents the mesovarium. Ventrally a strong fold, as described by Daudt, passes from the beginning of the uterine cornu over the expanse of the ligamentum latum back to the inguinal region. This is the ligamentum teres uteri (Fig. 12 *e*). Besides some minor folds which radiate away from the ovary and form the attachment of the ovary to the parietes there is a forwardly directed major fold—the plica diaphragmatica. This runs forwards from the ovary lateral to the kidneys (Figs. 12 *b*, 21 *f*), and diminishing in height, merges with the lining of the abdominal cavity in the neighbourhood of the diaphragm. A constant feature of the origin of this fold from the ovary is a lobe of fatty tissue on its mesal side close to the anterior pole of the ovary. In foetuses this lobe is small in comparison with the ovary, but it becomes very large in adult whales. Beauregard and Boulart described two further fatty masses, circular in outline, within the ligamentum latum on either side of the vagina; but these were not seen.

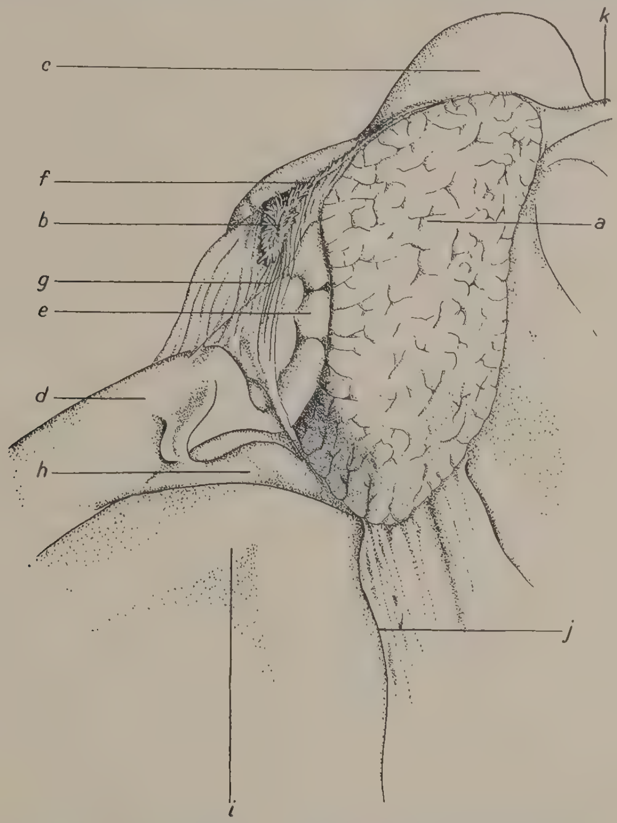


Fig. 13. Dorsal view of the right ovary and its attachments in Fin whale foetus 2·1 m. in length. (× 1½.)

a. Ovary.
b. Ostium abdominale.
c. Fatty lobe at anterior pole of ovary.
d. Uterine cornu.
e. Fallopian tube or oviduct.
f. Fimbriated ridge extending on to anterior pole of ovary from the ostium abdominale.
g. Triangular fibrous sheet carrying the ovarian funnel.
h. Ligamentum ovarii.
i. Ligamentum latum.
j. Mesovarium.
k. Plica diaphragmatica (proximal end).

The oviduct and ovarian funnel

Rapp (1837) mentions that in *Phocaena phocaena* the ends of the Fallopian tubes are "extraordinarily widened" and Turner (1870 *b*) said that in *Orcinus* the width of the tuba mouth embraced the whole ovary. In *Hyperoödon* Weber (1886) found the tuba mouth even more widened, and described the edges of the funnel converging to a tag running on to the rostral pole of the ovary, as described for the *Balaenoptera* under review.

Murie (1873) in *Globicephala melaena* found that the broad ligament and the fimbriae form "a delicate arched covering or pavilion which overarches the ovary". Turner (1870 *b*), describing the conditions in *Orcinus*, wrote: "Immediately on the uterine side of this mouth" (of the Fallopian tube) "was an elongated deep pouch-like recess formed by a folding on that part of the broad ligament which extended between the Fallopian tube and the root of the ovary". A comparable deepening of the ligamentum latum occurs in man and the Ruminants, and there is a similar enlargement of the tuba in the camel and in the swine. In the latter, however, the ovary is quite hidden in an egg sac.

In *Balaenoptera* the ovary lies free upon the ligamentum latum. The oviduct or Fallopian tube in the 2·1 m. foetus was a coiled tube 0·6 cm. in diameter (Fig. 13 *c*), involved in the attachments of the ligamentum to the ovary. It exhibited four successive U-shaped bends before joining the uterus. From the ostium abdominale, which looked backwards, the oviduct ran forwards for a very short distance and then turned ventrally back upon itself, forming an elbow the apex of which looked ventrally and rostrally (Fig. 14). The middle part of the course of the Fallopian tube was parallel with the long axis of the ovary and measured 3·5 cm. in a straight line. The duct takes three successive U-shaped bends in this region, an anterior and a posterior one with dorsally directed apices, and a middle one with a ventrally directed apex. The third part of the tube is nearly straight (Fig. 14), turning slightly outwards and finally mesally to join the uterus.

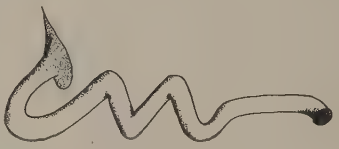


Fig. 14. Diagram to show the course of the Fallopian tube or oviduct in the Fin whale. (Left.)

The ovarian funnel or ostium abdominale (Fig. 13 *b*) is wide and funnel-shaped and is provided with simple processes (fimbriae) covered with the same ciliated epithelium as that which lines the oviduct. Weber (1886) and Daudt deny the presence of fimbriae. Daudt (p. 300) wrote: "the ostium abdominale...has a perfectly even outer edge". Scott and Parker (1889), however, found that the Fallopian tube of *Ziphius* "opens by the usual delicate and fimbriated extremity into a deep pouch of peritoneum". Murie also mentions fimbriae in *Globicephala*. In *Orcella* Anderson (1878) described the Fallopian tubes as lined with "fine lamellar folds of different depths...the laminae are prolonged outwards on to the pavilion in a radiate manner".

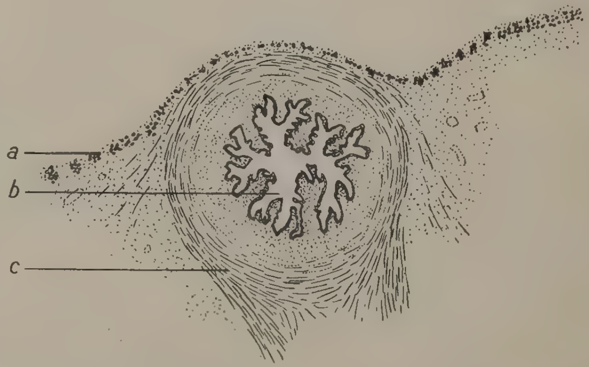


Fig. 15. Transverse section of the oviduct or Fallopian tube in a 2·1 m. Fin whale foetus.
a. Muscle layer of ligamentum latum. *b*. Oviduct.
c. Circular muscles of the oviduct.

The anterior edge of the ovarian funnel in *B. physalus* is drawn out into a thin fold of ligament (Fig. 13 *f*), along which a line of diminishing fimbriae extends on to the anterior pole of the ovary. A similar fold was described by Weber (1886) for *Hyperoödon*, in which a groove, with fimbriae arranged on each side of it, was found running to the ovary along the fold, as a continuation of the tuba mouth whose edges are drawn out to form the fold.

Within the oviduct itself a number of compound folds, covered with the same ciliated epithelium, projects into the lumen, greatly reducing its area in transverse section (Fig. 15). Around the canal is a layer of circular fibres, which spread out also into the ligamentous attachments of the tube (Fig. 15 *c*). No longitudinal muscles were found belonging to the oviduct itself but the broad ligament has a superficial muscular lamina, which, at the junction of the ligament with the oviduct, is brought into close proximity with the circular muscles surrounding the tube (Fig. 15 *a*).

The uterus

The uterus (Fig. 12 f^1, f^3) possesses two long cornua joining medianly to form a short corpus. The cornua pursue a curved course from the ovaries and Fallopian tubes to their junction with the corpus a little behind the level of the posterior pole of the left kidney. While the right cornu, however, describes an almost perfect semicircle, the left describes the arc of a circle of very much longer radius. In the foetus 2·1 m. in length the right cornu measured 10·5 cm. along its curve from the junction with the oviduct to the entrance into the corpus. The distance in a straight line between these two points was 8·0 cm. The left cornu, on the other hand, measured 9·5 cm. around its curve, while the distance between its extremities in a straight line was 8·5 cm. The right cornu curves forwards from the oviduct across the pole of the right kidney, after which it curves more gently backwards towards the middle line (Fig. 12). The left cornu has no forward direction at the beginning of its course, but runs backwards in a gentle curve across the left kidney between the posterior first and second thirds of the organ (Fig. 12).

In the foetus 2·1 m. in length each cornu was of even diameter and measured 1·25 cm. in diameter at its middle. In young whales, just before the attainment of sexual maturity, the diameter of the cornua, though varying considerably, averages about 4·0–5·0 cm. (in Fin whales 15·0–16·0 m. in length). At sexual maturity the diameter is about 10·0–12·0 cm. In Fin whales after sexual maturity the diameter of the uterus in a whale which is neither pregnant nor lactating—that is a resting whale—averages about 17·0 cm., although variations occur between 15·0 and 25·0 cm. Mackintosh and Wheeler (1929, pp. 397–401) have dealt with the changes in size of the uterus at sexual maturity and after. These authors find that when an ovulation occurs without fertilization of the ovum increase in diameter of the uterus takes place (perhaps up to 40·0 cm.). During pregnancy the uterus grows very greatly, and when a large foetus is present it may attain a diameter of over a metre. The growth in size of the pregnant cornu is considerably faster in the early stages of pregnancy than in the later, and there is a slowing down by the time the foetus has reached a length of 3·0–4·0 m. This is connected with the considerably faster growth of the foetus itself in the early stages of pregnancy.

The development of the foetus takes place in one cornu of the uterus, but the large chorionic vesicle extends itself into the corpus and into the other cornu. There appears, however, to be no intimate union between the placenta and the uterine wall at any stage in the development. The non-pregnant part of the uterus also undergoes considerable enlargement with the size of the foetus, but the growth is far less marked than that of the pregnant cornu. When the pregnant cornu contains a foetus 4·0–5·0 m. in length and measures 90·0–95·0 cm. in diameter, the non-pregnant cornu may have enlarged to the order of 70·0 cm. The uterus recovers quickly after parturition and in lactating whales assumes its normal resting dimensions—namely about 17·0 cm.

At their junction with the short corpus the cornua remain still separated by a median tongue (Fig. 12 f^2). In the 2·1 m. foetus this measured 3·0 cm. in length. This tongue projects backwards into the lumen of the corpus so that the cornua finally join together very obliquely. The corpus uteri (Fig. 12 f^3) is very short. In the 2·1 m. foetus the distance from the tip of the median tongue to the narrow entrance to the vagina was 3·0 cm. The lining mucous membrane of the cornua and of the corpus is raised into very numerous short parallel ridges, longitudinal in direction, with depressions between them. These ridges are firm and erect in the foetus, but in older whales, after weaning, they take on the character of loose folds. The corpus has one or two very slight circular constrictions (Fig. 12), foreshadowing, as it were, the vaginal pleats shortly to be described. The longitudinal ridges of mucous membrane are continued over these constrictions which do not make the complete circuit of the lumen of the corpus.

Transverse sections of the cornua (Fig. 16) reveal the ciliated epithelium intact only between the parallel ridges. In the foetus 2·1 m. in length the glands were not yet properly developed. As Turner remarked the glands are probably not developed during intra-uterine life and are not fully formed until sexual maturity. Beneath the mucosa is a thick layer of circular muscles. At this stage, at any rate, no longitudinal muscles were found except those belonging to the broad ligament. Outside the circular muscle layer is a serous coat.

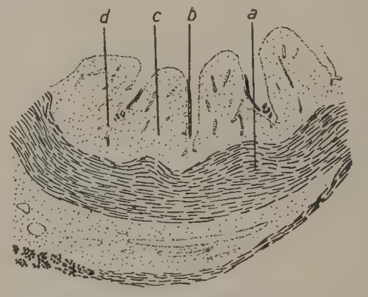


Fig. 16. Transverse section of part of the wall of the uterine cornu in a 2·1 m. Fin whale foetus. (× 2½.)

- *a*. Circular muscle layer.
- *b*. Epithelium (intact only between the ridges).
- *c*. Embryonic mucosa.
- *d*. Developing glands.

The entrance of the corpus uteri into the vagina is marked by a circular constriction (Fig. 12) forming a passage (0·9 cm. long in the 2·1 m. foetus) lined by the same parallel ridges as are found throughout the corpus and the cornua. At the upper end of this comparatively narrow passage is the os internus which is wider than the lower aperture which forms the os externus leading into the vagina. Both these uterine apertures, however, are ill defined and take the form of narrowings of the uterine lumen rather than of a definite os uteri. The position of this narrowing is marked externally upon the uterine wall as a slight neck dorsally; but ventrally it is invisible.

The vagina

The vagina (Fig. 12 f^4, f^5) has considerably thicker walls than the uterus and widens rapidly from the os backwards. In the 2·1 m. foetus the vagina was 15·0 cm. in length from the os to the vulva, and 3·5 cm. in its greatest width which occurs in its anterior third. From this region it diminishes slightly to the vulva.

The vagina may be regarded as consisting of two parts—an anterior part occupying about a quarter of the length of the passage where the walls are thrown into a number of circular folds (Fig. 12 f^4), and a posterior part, occupying the remaining three-quarters of its length, where the walls are plane and unfolded (Fig. 12 f^5). In the foetus examined the anterior three folds in the wall of the fore part of the vagina projected funnelwise backwards, reducing the cavity to extremely narrow dimensions. The two foremost of the three are very large, but the third is considerably smaller (Fig. 12 f^4); the fourth is smaller than the three preceding ones and projects forwards funnelwise into the lumen so that its lips touch those of the backwardly projecting funnel in front of it. Two or three other very much smaller folds, of which only the foremost runs completely round the vagina, intervene between the much folded part and the posterior unfolded part of the vagina.

At least six vaginal folds were thus found. There are individual as well as specific differences in the numbers of folds in the vaginal wall. The following is a selection from the accounts of various authors showing the variations in the numbers of these folds which are of universal occurrence throughout the Cetacea.

Balaenoptera musculus, 8. Beauregard and Boulart (1882).
Balaenoptera physalus, 4. Beauregard and Boulart (1882).
Balaenoptera physalus, 12. Daudt (1898).
Balaenoptera physalus, 6. Ommanney.
Delphinapterus leucas, 8. Watson and Young (1879).
Globicephala melaena, 4. Murie (1873). Another fold also on which the mucosa was uterine.
Orcella brevirostris, 3–4. Anderson (1878).
Phocaena phocaena, 9–12. Daudt (1898).
Ziphius sp., 5. Scott and Parker (1889).

The inner surface of the walls of the vagina is made up of a great number of very small anastomosing ridges, which run in a longitudinal direction and are continued over the anterior funnel-shaped folds. In transverse sections across the wall of the vagina (Fig. 17) the ridges are seen to be covered with lateral papillae, giving to the section of the ridge a compound appearance. The lining columnar epithelium is more than one stratum in thickness and appears to have an outer cornified layer. It is found intact only in the depressions between the ridges (Fig. 17 *b*). At this stage at any rate no glands were seen opening into the vagina. The lining epithelium is based upon a fibrous corium throughout the vagina. In the posterior plane-walled portion the muscle layers are poorly developed (Fig. 17 *a*), and only a scanty layer of muscle fibres was detected having a longitudinal direction. In the folded section of the vaginal wall, however, circular muscle layers are powerfully developed (Fig. 18 *a*); they are probably continuous with the circular layers within the walls of the uterus, although no sections were taken to prove this point. These strong circular layers are continued up into the limbs of the folds where they form an extremely stout mass of circular muscles within the folds themselves (Fig. 18). Outside the circular muscles is a serous coat, which is also prolonged into the folds and carries blood vessels into them. The papillate ridges of the vaginal wall are continued over the folds longitudinally (Fig. 18).

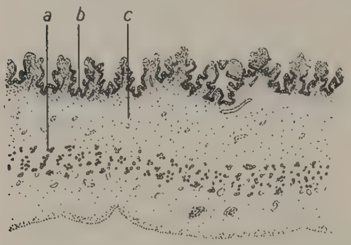


Fig. 17. Transverse section across the smooth part of the vaginal wall in a 2·1 m. Fin whale foetus. (At right angles to the long axis of the vagina.)

a. Longitudinal muscle layer, poorly developed.
b. Epithelium (intact only between the ridges).
c. Fibrous corium.

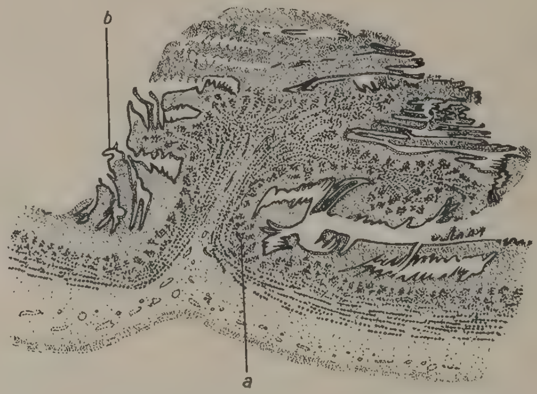


Fig. 18. Transverse section across one of the folds of the upper part of the vaginal wall in a 2·1 m. Fin whale foetus. (Parallel with the long axis of the vagina.)

a. Circular muscle layer. *b*. Epithelium.

Immediately in front of the external opening of the vagina into the vulva the inner surface of the wall again exhibits a folded arrangement (Fig. 11 *c*). These folds are longitudinal and take origin from a sharp constriction which marks off the vagina from the vulva. They are chiefly lateral in position and by their presence form two deep main grooves, with other subsidiary ones, on either side of the posterior part of the vagina, while immediately dorsally and ventrally is a raised area which is not folded and has a plane surface (Fig. 11). The lateral longitudinal folds pass forwards along the side walls of the vagina for about a third or less of the length of the smooth part of the passage and diminish anteriorly, merging with the plane surface of the wall, while the grooves caused by their presence widen out and disappear. Sections across these longitudinal folds (Fig. 19) show that they are made up of the fibrous corium of the vagina—the connective tissue fibres being directed upwards into them. Within the grooves the lining columnar epithelium of the vaginal wall is intact. Although the glands are not yet properly developed in the corium the grooves between the glands suggest by their appearance that they are highly glandular in older whales; indeed, at the summits of the folds the glands can already be seen in section both within the grooves and around the crest of the folds. It is possible that these glands correspond to the glands of Bartolini which occupy a similar position in other mammals. At this terminal part of the vagina occurs the vaginal sphincter muscle already referred to.

Comparing the condition of the uterus and vagina of the Cetacea with that of other mammals, we find the uterus bicornis also in Insectivora, Carnivora (Fissipedia and Pinnipedia) and Ungulata (Perissodactyla and Artiodactyla).

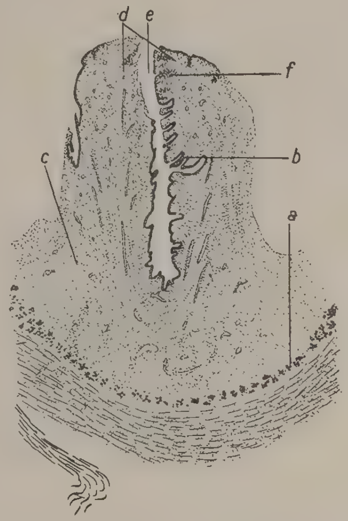


Fig. 19. Transverse section across the longitudinal folds at the lower end of the vagina of a 2·1 m. Fin whale foetus, showing two folds and the groove between them.

a. Longitudinal muscle layer.
b. Epithelium.
c. Fibrous corium.
d. Apices of the two folds.
e. Groove between the folds.
f. Developing glands in the groove.

In the Insectivora there is either no os uteri marking off a distinct corpus from the vagina (the mole and the shrew) or, as in the hedgehog, there is an os uteri and a short corpus. The vagina has transverse folds at its uterine extremity. The ovaries are always enclosed in a peritoneal capsule. There is a marked plica diaphragmatica.

In the Carnivora (Fissipedia) the os uteri is well developed and the corpus uteri short and wide. The vagina usually lacks the marked transverse reduplications of its walls seen in the Cetacea and some Insectivores. The ovaries are enclosed in a capsule formed by the peritoneum. In the Pinnipedia the corpus is also short and the cornua, as in the Cetacea, continue separately for some distance after they appear externally joined. The ovaries are enclosed in peritoneal capsules.

Among the Artiodactyle Ungulates the camel shows a short corpus. There is no definite os, but the uterus is marked off from the vagina by a series of nearly transverse folds which almost but not quite complete the circle. The capsule of the ovary seems to be formed by the fimbriated oviducal funnel. In the deer, antelope, ox and sheep the ovary is lodged in a recess or sacculus of the broad ligament, such as many authors describe for various Cetacea. An os uteri is present, having the form of a transversely oval prominence. Transverse foldings of the vaginal wall are not found in any Artiodactyle.

In the Perissodactyles (rhinoceros) the corpus uteri is short. The cornua are beset by close-set longitudinal folds. The vagina and uterus are not sharply marked off from one another; but the walls of the utero-vaginal canal in this region are thrown into transversely circular folds, of which the lowest are the largest. They are alternately arranged so as to give the genital canal a spiral course. The ovaries lie in a peritoneal sac. In the mare the vaginal folds do not exist and the os uteri is marked by a sphincteric thickening of the walls of the canal.

It is seen that among these groups of mammals there is little comparison with the Cetacea, since points of resemblance in any group are negatived by equally important differences. The Artiodactyle Ungulates, however, tend to resemble the Cetacea in the implantation of the ovary within the broad ligament in the Ruminants, and the formation of the capsule of the ovary from the fimbriated oviducal funnel in the camel. The folds of the wall of the vagina at the uterine extremity of the passage are seen in Perissodactyles and Insectivores. In the latter group also there is a well-defined plica diaphragmatica, but the presence of a peritoneal ovary sac constitutes an important difference from the Cetacea.

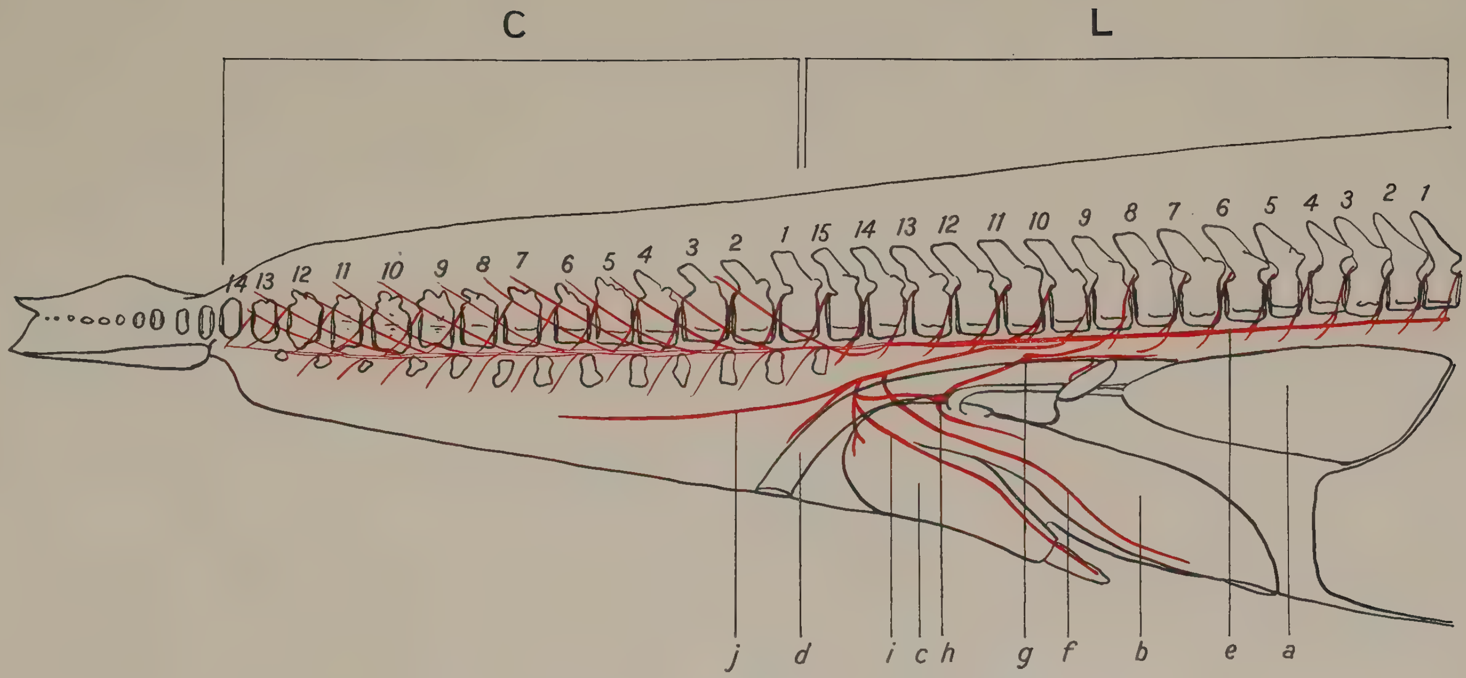
The vascular supply

The description already given for the male sex applies equally to the female. The pudic artery passes through the vascular foramen of the rectus muscle and over the belly of the ischio-cavernosus muscle near the median raphe (Fig. 12 j^3). It passes to the tip of the clitoris, along the face of which it is turned towards the vulva and therefore corresponds to the anterior face of the penis. A corresponding vein accompanies this artery. Branches come off from the pudic arteries, accompanied by corresponding veins, to the sides of the vulva and the ischio-cavernosus muscle. The ovarian arteries and veins correspond in position with the spermatic veins of the male; they enter the ovary at the posterior end of the medianly directed hilus by which the ovary is attached to the ligamentum latum.

NERVES OF THE GENITAL REGION

A stout lumbo-genital nerve (Fig. 20) is derived from the 10th, 11th and 12th lumbar spinal nerves, and runs outwards and backwards towards the generative tract between the deep and superficial parts of the hypaxial muscles. In the inguinal region this nerve divides upon the inner surface of the rectus muscle and splits up, in the male, into a number of branches to the prostata and to the muscles of the penis. A major branch ascends upon the anterior face of the penis (Fig. 20 *i*) as a pudic nerve, accompanying the arteries and veins of that name through the vascular foramen of the rectus muscle. It becomes plexiform upon the shaft of the organ and enters the terminal cone. There is also a branch from the point of origin of the pudic nerve running to the rectum. In the female the neuro-vascular foramen of the rectus admits homologous nerves to the vulva and the lower part of the vagina and a major branch to the clitoris. The branch to the clitoris corresponds exactly to the pudic nerve of the male; it passes to the tip of the organ along its vulvar face, which is homologous with the anterior face of the male penis. The rectal branch is also present in the female. Before passing through the foramen of the rectus the genital nerve in both sexes sends backward a long stout lumbar branch (Fig. 20 *j*), which accompanies a superficial lumbar vein and passes outwards behind the pelvic bone and backwards towards the tail lateral to the ischio-caudalis muscle. The hypogastric nerve (Fig. 20 *f*) is given off from the lumbo-genital nerve in front of the foramen of the rectus and passes forwards upon the ventral face of the umbilicus.

A large centrally placed hypogastric sympathetic ganglion (Fig. 20 *h*) is situated dorsally upon the neck of the bladder, close to the point where the hypogastric arteries ascend upon the umbilicus. It sends sympathetic nerves forwards on to the umbilicus, and is connected with the 9th segmental sympathetic ganglion of each side by a single nerve passing forwards and upwards to a small sympathetic ganglion dorsal to the rectum (Fig. 20 *g*). From this nerves run to the ovary and testis and forwards along


C
L
14 13 12 11 10 9 8 7 6 5 4 3 2 1
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
j
d
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a

Fig. 20. Nerves of the genital region in the Fin whale. (Diagrammatic.)
C. Caudal vertebrae. *L.* Lumbar vertebrae.

a. Kidney.
b. Bladder.
c. Bulbus penis.
d. Rectum.
e. Dorsal sympathetic nerve cord.
f. Hypogastric nerve.
g. Sympathetic ganglion.
h. Hypogastric sympathetic ganglion.
i. Pudic nerve.
j. Lumbar nerve.

the dorsal lymph tract. From this ganglion a pair of nerves connects with the 9th segmental sympathetic ganglion on each side.

The hypogastric ganglion is connected with the lumbo-genital nerve by a fairly extensive nerve plexus, whose components pass through the inguinal vascular plexus, but do not appear to have any relation to it. Nerves to the two great inguinal lymph glands are given off, however, by the plexus. The main elements of the plexus are made up of rami joining the lumbo-genital nerve to the hypogastric ganglion immediately within the foramen of the rectus abdominis muscle.

THE URINARY SYSTEM

THE KIDNEYS

When the body cavity is opened ventrally and the umbilicus turned aside (Fig. 21) the organs displayed are the right and left kidney, the left lobe of the liver, the ovaries, uteri and their ligaments in the female, and the testes and their suspensory ligaments in the male.

The kidneys are long, roughly oval, lobulated bodies occupying a very large part of each side of the abdominal cavity. The part of the right kidney exposed in ventral view lies somewhat anterior to that of the left and is smaller in extent. The right kidney is overlaid mesally by the coils of the small intestine; the pressure of the latter causes an indentation (Fig. 21) on the mesal face of the organ, the apex of the indentation lying on a level with the left lobe of the liver. The exposed surface of the kidney is thus somewhat crescent-shaped and is bounded by the liver in front, the intestine mesally and the uterine ligaments behind. The ovary lies on the kidney laterally. The visible surface of the kidney presents two planes—one directed meso-ventrally, which is part of the mesal face of the organ, and one lateral which is part of the latero-ventral face of the organ.

The exposed surface of the left kidney is larger than that of the right and in its greatest extent is posterior to it. It forms a roughly shoe-shaped area, in contact antero-mesally with the left lobe of the liver and postero-mesally with the coils of the intestine. Posteriorly again the left kidney is bounded by the uterus and its ligaments. In the male the testes and their vasa deferentia overlie the proximal part of the ureter on the right side and the posterior tip of the kidney on the left, the most anterior curve of the vas deferens forming the boundary of the exposed surface of the kidney on that side. The exposed surface of the left kidney, like that of the right, also presents two planes; but both these planes, unlike those on the other side of the body, are part of one face of the kidney—the latero-ventral. The mesal face is hidden by the intestine.

The uterine cornua, or the testes and their ligaments in the male, hide the rectum, which lies immediately dorsal to them against the roof of the body cavity, closely invested by the peritoneum. It emerges from the coils of the small intestine close to the left kidney, turns forwards towards the right side and then back into the middle so as to form a U-shaped bend before the commencement of its straight course dorsal to the genital tract (Fig. 22).

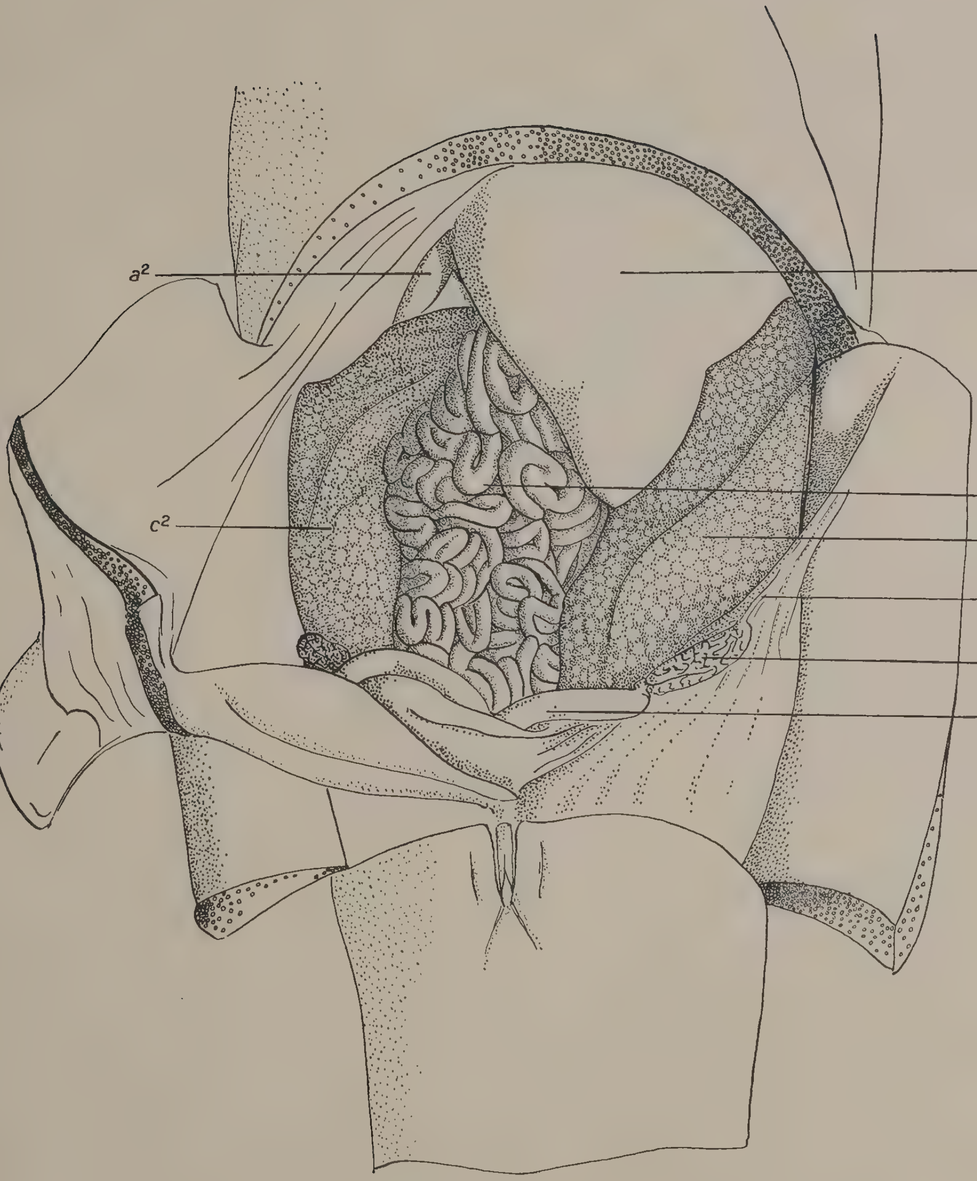


Fig. 21. Viscera of a female Fin whale foetus 1·73 m. in length, *in situ*. (× $\frac{1}{3}$.)

a^1. Left lobe of the liver.
a^2. Right lobe of the liver.
b. Intestines.
c^1. Left kidney.
c^2. Right kidney.
d. Ovary.
e. Uterine cornu.
f. Plica diaphragmatica.

The posterior parts of the kidneys form rounded bosses when seen *in situ*, the left considerably more rounded and wider than the right and lying posterior to it (Fig. 22). This rounded outline of the posterior parts of the kidneys is markedly different from their tapering form when extracted. It is due to the fact that the investment of the organ —a reflection of the peritoneum—is more closely attached to the body wall at the hinder end of the kidney than at any other point. Its component fibres run sharply outwards and forwards from this point over the mesal face of the kidney, so that the true posterior end of the kidney, from which the ureter emerges, is pulled round laterally as the kidney increases in bulk and becomes hidden by this stretched portion of the kidney investment. This is seen better on the left than on the right side when the kidneys are observed *in situ* since the line of attachment of the right organ is more dorsal, so that the kidney overlies the emergence of the ureter in ventral view.

In consequence of the deflection of the posterior end of the kidney the emergence of the ureter on both sides is seen to be not immediately posterior and apical (Fig. 22), as in the extracted organ, but somewhat lateral—the duct pursuing a short forward course before bending round to its main caudal and inward direction. The ureters on both sides are hidden by a great pad of fibrous tissue, in which they are embedded, and by the peritoneum, which is reflected over them throughout their length.

The true form of the kidney can only be seen when the whole of the viscera have been removed, including the liver and the stomach (Fig. 22). The right kidney is anterior to the left—its foremost extremity lying rostrally of the tip of the left kidney by about 2·0 cm. in a foetus 1·73 m. long.

The left kidney is roughly semicircular in outline and presents three faces—a broad latero-dorsal one, a latero-ventral and a narrower mesally directed one. The angle between the two lateral faces is rounded; but the mesal face makes a sharp angle with them, especially anteriorly, where the left lobe of the liver presses against the mesal face of the kidney causing in it a slight incurving. In consequence of this incurving the mesal face of the left kidney takes the form of a backward S in ventral view; the rostral loop of the S is small and embraces the left lobe of the liver, while the caudal loop is long and gently curved and forms the main mesal face of the organ abutting upon the intestines.

The right kidney is roughly oval in outline and tapers more markedly than the left. Its greatest breadth occurs about one-third of its length from its anterior extremity. It also presents three faces—a latero-dorsal, a latero-ventral, and a mesal face slightly more ventrally directed than on the other side. The latero-dorsal is the widest of these three faces. Antero-ventrally is a small fourth face, roughly diamond-shaped, caused by the pressure of the stomach against the kidney and also of some of the intestinal coils. On either side of this antero-ventral face the other three faces diminish rostrally to a tip.

Beauregard and Boulart (1882, p. 61) recognize only two faces to the kidney—a superior and an inferior. They mention, however, a thick external border, which is presumably the latero-ventral face. If this is correct the latero-ventral face must have been the smallest of the faces of the kidneys examined by these authors and the latero-dorsal the largest—an arrangement similar to that described above.

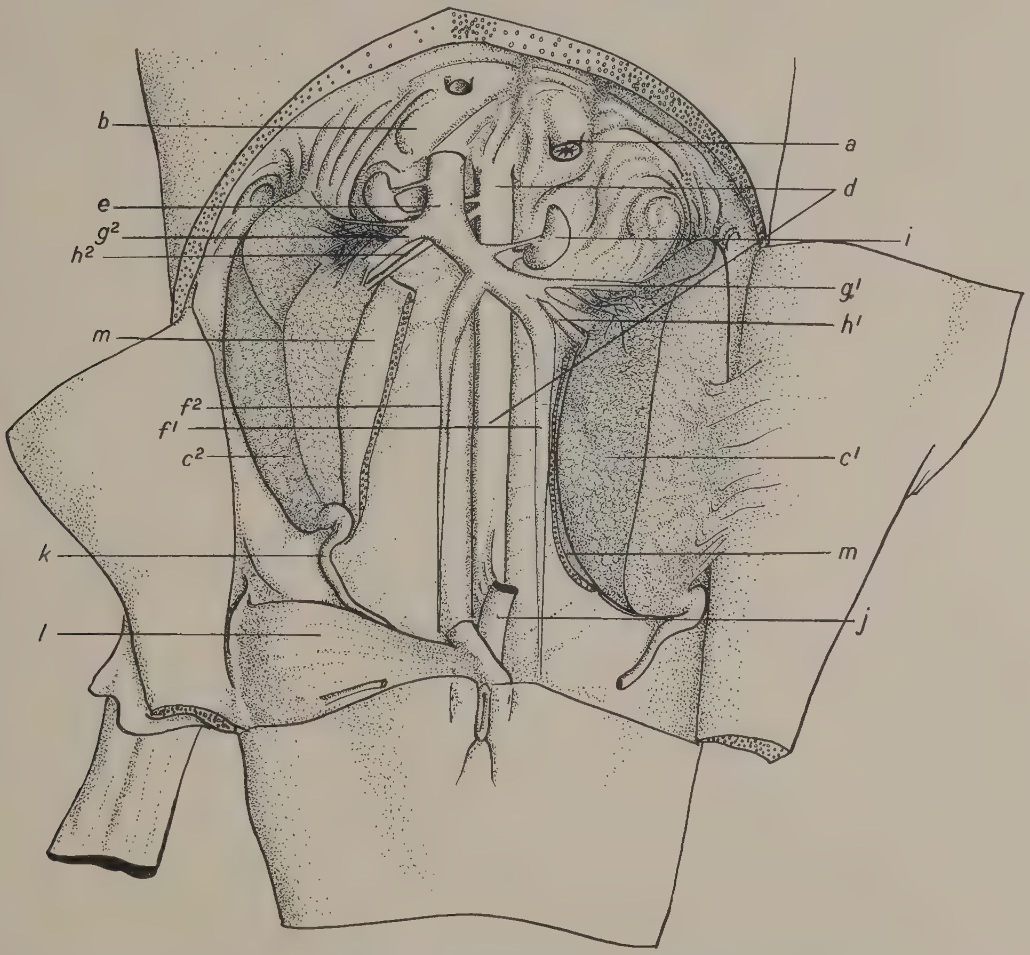


Fig. 22. Abdominal cavity of a female Fin whale foetus 1·73 m. in length, after removal of liver and intestines, to show position and relations of the kidneys. (× $\frac{1}{3}$.)

a. Oesophagus.
b. Diaphragm.
c^1. Left kidney.
c^2. Right kidney.
d. Dorsal aorta.
e. Post-cava.
f^1. Left post-caval trunk.
f^2. Right post-caval trunk.
g^1. Left renal vein.
g^2. Right renal vein.
h^1. Left renal artery.
h^2. Right renal artery.
i. Left adrenal body.
j. Rectum (cut).
k. Right ureter.
l. Bladder.
m. Serous sheet between the kidneys.

The coverings of the kidney

Daudt (1898, p. 278) described three coverings to the kidney, an outer connective tissue serosa, which is a reflection of the peritoneum and forms a sac in which the organ is slung, and an underlying capsula fibrosa, the true covering of the kidney. Beneath the capsula and in intimate contact with it Daudt described the tunica albuginea, a third fibrous investment, extending into the organ between the lobes and lobules of which it is composed.

In the youngest kidney examined in the present work—that of a *B. musculus* foetus 18·5 cm. in length (Fig. 23 *f*)—only one fibrous layer could be seen in section, completely surrounding the kidney and sending branches into the interior of it. Bouvier (1892) mentions only one fibrous capsule round the kidney of *Hyperoödon*. In *Balaenoptera* this fibrous capsule is derived partly from the peritoneum and partly from the thick fibrous pad situated immediately dorsal to the kidney between the kidney and the hypaxial muscle. In kidneys from foetuses of length 0·5–1·0 m. this enveloping serous coat can be seen to be composed of two layers separated by lacunae (Figs. 24, 25), which become progressively more extensive in older kidneys. These form the reticulate peripheral venous channels to be described later and their uniform distribution throughout the serosa divides it into an outer fibrous layer, the true serosa, deriving most of its fibres from the peritoneum, and an inner layer, the capsula fibrosa, which derives most of its fibres from the fibrous pad above mentioned. The two layers, although continuous to a large extent, can be dissected apart with ease in kidneys of foetuses more than about 1·0 m. in length. In the adult the space between these two investments is abundantly charged with fat so that the serosa is thrown into folds and ridges of fatty tissue which mask the true shape of the kidney. The capsula sends fibrous septa into the body of the organ between the lobes and lobules of which it is built up. Under the capsula the lobes and lobules of the young kidney are extremely closely invested by a very thin layer of fibres which is inseparable from them and extends among the capsules and tubules and forms a scaffolding within the kidney tissue. This probably represents the tunica albuginea of other mammals, since in older foetal and adult kidneys it forms the covering of the individual "renculi"—little kidneys—of which the organ is composed.

The serosa forms a connective tissue sling in which the kidney is suspended within the body cavity. In young foetuses up to about 0·5 m. in length the serosa of the kidney is almost flush with the peritoneum forming the roof of the body cavity—that is to say, the kidney does not hang down within the cavity, but lies under the connective tissue layers of the roof, a slight swelling only marking its position. Later, however, it becomes slung from the roof of the body cavity as it increases in size and weight, and the part of the peritoneum which formerly covered it becomes the serosa, attaching the kidney to the body wall along a broad strip following the angle between the latero-dorsal and mesal faces. The line of attachment of the serous mesentery to the kidney runs from the point of entrance of the blood vessels into the mesal face, about one-third of the length of the organ from the anterior end, to the point of emergence of the ureter behind. As mentioned before, the attachment of the serosa to the body wall is closer posteriorly than elsewhere and causes a lateral deflection of the ureter. Anteriorly the line of attachment shifts on to the mesal face itself so as to include the blood vessels, and in front of them the serosa extends on to the diaphragm. The serosa of the left kidney has also an attachment to the ventral abdominal wall, as shown in Fig. 22, throughout a portion of the organ where the latero-ventral face presses against the ventral peritoneum. The serosae of the two kidneys are continuous with one another across the roof of the body cavity and form a broad sheet of connective tissue (Fig. 22 *m*) under which, in ventral view, lie the aorta and postcava.

The serosa and capsula are continuous with the connective tissue laminae of the interior of the kidney along a line running down the centre of the mesal face of the kidney from the point of entrance of the blood vessels to the posterior emergence of the ureter. There is an involution of the fibrous investments along this line (Figs. 23, 24, 25 *c*), so as to form a horizontal sheet within the kidney dividing its contents into two separate ventral and dorsal parts.

The structure of the kidney

The kidney is a composite body. It is made up of a great number of little kidneys bound together by the above fibrous investments. The little kidneys will be called "renculi", following the practice of Daudt and Beauregard and Boulart. Owen, however (1868, vol. III, p. 608), gives to them the name "renule". In the adult each individual renculus is a complete unipyramidal kidney, with cortex, medulla, pelvis and calyx, and with its own arterial and venous blood system—exactly similar to the whole kidney of other mammals. The general disposition of the renculi is in groups (lobules) of as many as five or six. This, however, becomes less distinct in older kidneys as the renculi increase in size.

Scattered apparently at random throughout the substance of the kidney, renculi occur which are joined in pairs and occasionally in threes. Two types of conjoined renculi have been distinguished as follows:

(i) Renculi joined by their cortices and medullae.
(ii) Renculi joined by their medullae with their cortices free.

A fibrous septum is visible between the two members of a pair, continuous with the tunica albuginea and extending down as far as the junction of the cortical or medullary tissue. A part of the main arterial system of the renculus is always included in this septum. The septum completely separates the capsules and tubules of one member of the pair from those of the other, and there is no sign of any splitting of the tubules or capsules themselves around the line of separation. Externally upon the surface of the renculi an efferent vein follows the suture marking the line of separation between the members of the pair. The pelves and papillae of these conjoined renculi are nearly always separated from one another: only rarely were paired renculi found in which there appeared to be two joined papillae in one pelvis.

Beauregard and Boulart considered that the apparently paired and occasionally triplicated renculi should be regarded as the result of fusion of neighbouring renculi, but Daudt believed them to be the result of fission. There is, however, no sign of fission of the actual capsules and tubules themselves, such as might be expected along the line of separation of the members of a pair if a process of division were going on. In all foetal kidneys these renculi are found paired and triplicated from their earliest origin, so that it would appear that they arise in this condition from the beginning. As these pairs grow in size, however, the elongation of their tubules may possibly cause some measure of growth apart from one another of the two members of the pair.

There is no correlation whatever between the size of the kidney, or the size of the individual renculi of which it is made up, and the number of paired renculi in a random sample. Such a correlation, however, can hardly be expected, since the causes governing the growth of the renculi must be very diverse and must include a great variety of factors, such as the amount of space available among surrounding renculi and the position within the kidney with regard to the arterial supply, so that some renculi will grow faster than others and attain a larger size.

In spite of the many irregularities which exist in the structure of the kidney, it is possible to discern a definite basic architecture underlying the apparently random distribution of the renculi. All kidneys, both adult and foetal, are fairly definitely divided into a dorsal and a ventral half by a horizontal core of connective tissue (Figs. 23 *d*, 24 *d*, 25 *d*, 26 *c*), forming a fibrous plane lying in the centre of the kidney. The central core is in communication with the serosa and the capsula fibrosa along a slit, as mentioned before, in the mesal face of the kidney. This slit—the mesal slit (Figs. 23 *c*, 24 *c*, 25 *c*)—runs from the point of entrance of the blood vessels anteriorly to the point of emergence of the ureter behind. It corresponds to the hilus in a non-lobulated kidney. In these two extreme positions the slit is wide; but it narrows down considerably between them in the middle of its length, so that its opposite sides nearly meet. The actual kidney substance is thus crescentic in section (Figs. 23, 24, 25), the centre of the crescent being occupied by the central core which is continuous with the outer investments between the arms of the crescent. Anterior to the blood vessels there is no mesal slit.

At a variable number of points on the circumference of the transverse section of the organ, fibrous septa run inwards from the outer sheath to the inner core. Their number and position are variable but they are always present, dividing the kidney substance in any given transverse or longitudinal section into a number of lobes (Figs. 23, 24, 25, 26), some six or seven as a rule in transverse section. The lobes of the kidney are pyramidal in shape with their bases turned outwards upon the surface of the organ and their apices directed towards the central core. In longitudinal section (Fig. 26) they present the same triangular shape as in transverse section. The fibrous septa between the lobes—interlobar septa (Figs. 24, 25, 26)—are thus domes of connective tissue with their apices directed centripetally and their bases centrifugally. They carry the main primary urinary ducts from the renculi (Fig. 31) and the main afferent and efferent blood vessels. The lobes themselves are smaller and more numerous close to the horizontal plane of the kidney, and larger and more diffuse on the dorsal and ventral aspects. The main urinary duct and the main blood vessels supplying the lobes lie in the central core (Fig. 32).

In the youngest kidney examined (18·5 cm., *B. musculus*) the lobes were distinctly discernible, divided by interlobar septa (Fig. 23 *a*). The peripheries of the lobes, however, show signs of division into subsidiary lobules by fibrous laminae running inwards between the capsules and tubules (Fig. 23 *b*). These are the interlobular septa. At this

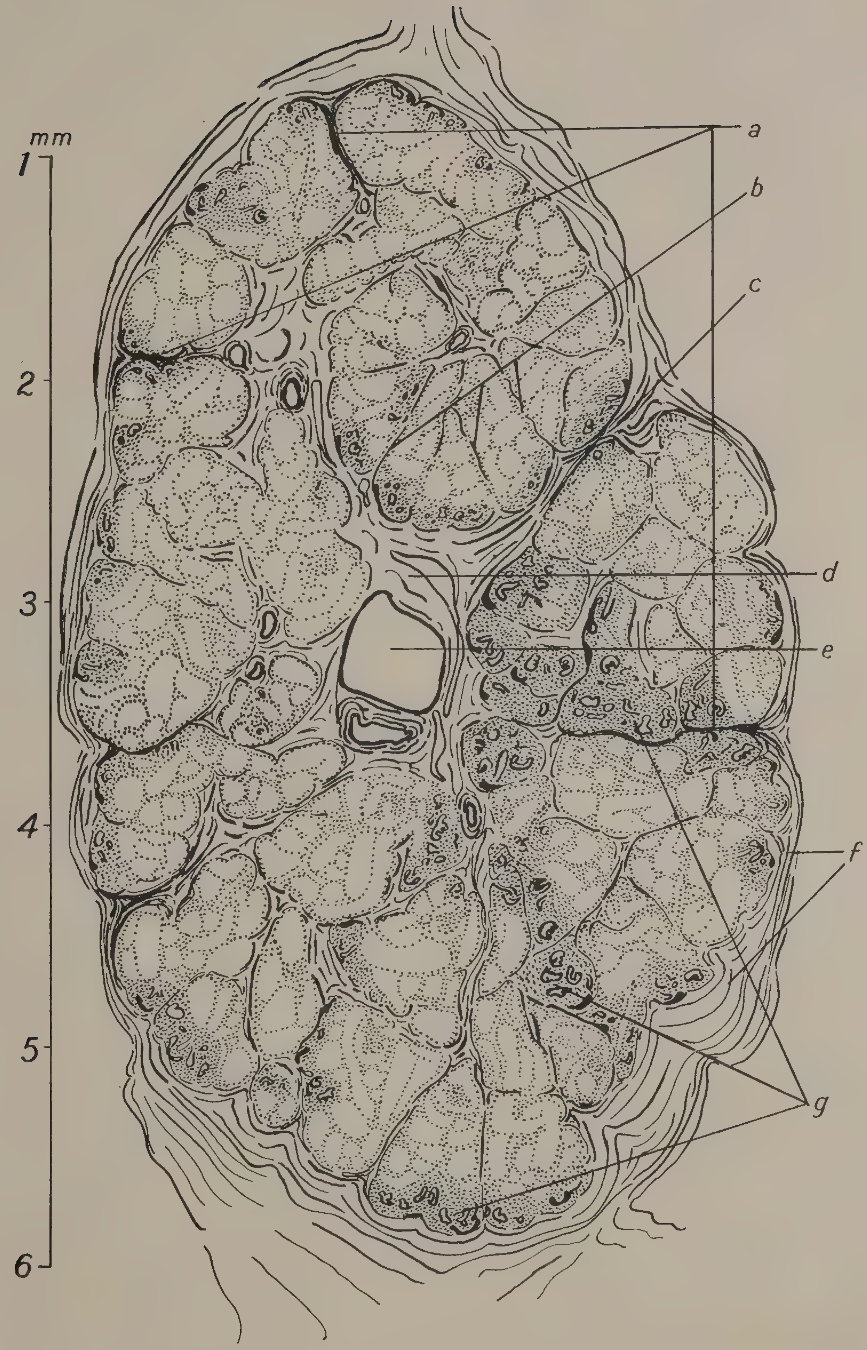


Fig. 23. Transverse section of the whole kidney of a Blue whale foetus 18·5 cm. in length. Note that the kidney substance is crescent-shaped and that the central connective tissue core of the organ (*d*) is in communication with the outer serosa (*f*) by means of the mesal slit (*c*). The section shows six lobes. Embryonic areas heavily dotted.

a. Interlobar septa.	*e*. Main urinary duct.
b. Interlobular septa.	*f*. Serosa.
c. Mesal slit.	*g*. Embryonic areas.
d. Central connective tissue core.	

stage the centres of the lobes still present the appearance of a tangled mass of capsules, with their tubules and collecting ducts (Figs. 23, 27, 30). Thus, along the inner and outer circumference of the crescent of kidney substance in very young stages, the lobulation of the primary lobes can be distinguished, but is as yet undiscernible within the body of the crescent.

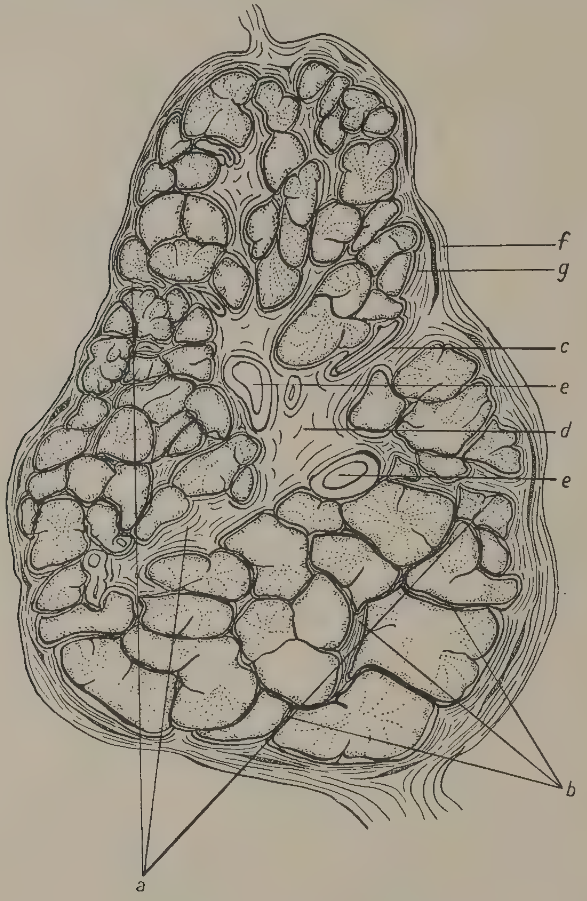


Fig. 24. Transverse section of the whole kidney of a Fin whale foetus 0·6 m. in length. (× 5.) The section shows five or six lobes. Note that they are small and less distinct in the region of the mesal slit (*c*). The lobes are sub-divided into well-defined lobules, which are themselves beginning to divide into renculi.

a. Interlobar septa.
b. Interlobular septa.
c. Mesal slit.
d. Central connective tissue core.
e. Urinary duct.
f. Outer layer of fibrous investment (serosa).
g. Inner layer of fibrous investment (capsula fibrosa).

In rather older stages (kidneys from foetuses about 0·5 m. in length) the lobulation is distinct throughout and each lobe of kidney substance is seen to be divided into an irregular number of discrete lobules, almost separated from one another by the inter-

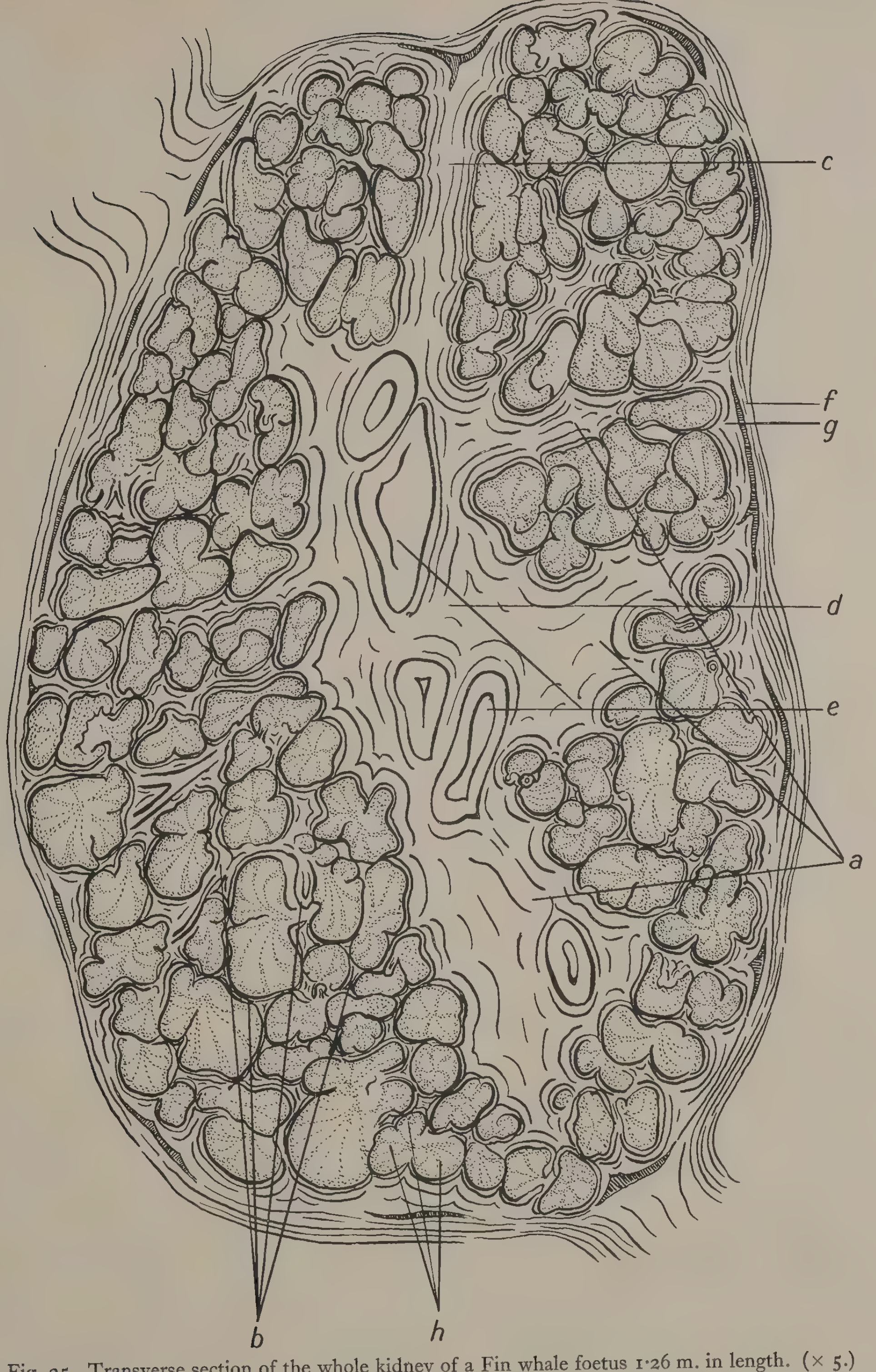


Fig. 25. Transverse section of the whole kidney of a Fin whale foetus 1·26 m. in length. (× 5.) The section shows some seven or eight lobes. Division of the lobules into renculi has proceeded a step further than in the foetus 0·6 m. in length, so that each lobule consists of several renculi nearly rounded off.

- *a*. Interlobar septa.
- *b*. Interlobular septa.
- *c*. Mesal slit.
- *d*. Central connective tissue core.
- *e*. Urinary duct.
- *f*. Outer layer of the fibrous investments (serosa).
- *g*. Inner layer of fibrous investments (capsulafibrosa)
- *h*. Young renculi.

lobular septa (Fig. 24 *b*). In the centre of every lobe the lobules are less well defined, irregular and polygonal in shape. In still older foetal kidneys (from foetuses about 0·5 to 1·0 m. in length) the lobules are all definitely constricted from one another, and the capsules within them are arranged peripherally, so that their tubules converge towards the neck of the lobule and form secondary urinary ducts joining the main primary system. In the most completely constricted lobules the tubules join together to form a major trunk running through the neck of the lobule. In kidneys at about this stage, then (0·5 to 1·0 m. foetuses), the substance is divided into a number of pyramidal lobes by the interlobar septa. Each lobe is further divided into an irregular number of lobules by interlobular septa. The lobules are rounded on the outside of the lobes, but irregular and polygonal within (Fig. 24). In kidneys from foetuses about 1·0 to 1·5 m. in length still further subdivision is found. The rounded and constricted lobules themselves are seen to be divided into as many as five or six conjoined fan-shaped sections, which presently round off and become definite renculi (Fig. 25 *h*, 30 *B*) by the elongation of their necks and the outward growth of their peripheral tissue. The tubules in these incipient renculi join together to form a common duct running through the neck of the renculus, thus forming the tertiary ducts of the main system. The primary ducts have been described as running in the interlobar septa, the secondary ducts run from the lobules to the primary ducts, and the tertiary in the necks of the renculi of which the lobules are composed.

In the kidneys of a 1·5–2·0 m. foetus (Fig. 26) the lobules are completely divided into their component renculi, which are now circular in outline and have cortices and medullae formed by the peripheral arrangement of the capsules and the convergence of their collecting tubes. From about this point in the development of the kidney the lobule tends to become obliterated as a unit in the architecture of the kidney. With increase in the size of the renculi the lobules lose their identity, and interlobular septa become increasingly difficult to make out. In adult kidneys there is little trace of the original lobular disposition of the renculi and the lobes themselves become difficult to distinguish. The median plane of connective tissue formed by the central core persists in the adult, as does also the mesal slit, although the latter is frequently masked by accumulations of fat within the investments of the organ.

The lobes remain the architectural unit of the kidney in foetuses of up to 2·0 m. in length. As the renculi increase in diameter and come into contact with one another, the lobules coalesce with one another and become confused, and in foetuses over 2·0 m. in length are difficult to make out. In foetuses larger than 3·0 or 4·0 m. the renculi of the kidney appear to be indefinitely grouped. The disappearance of the interlobular septa is due to the pressure of the renculi against one another tending to squeeze out the boundaries between the lobes and lobules. In yet older kidneys—old adults—the same coalescence and disappearance overtakes the lobes, so that the renculi are the only architectural units that persist throughout the life of the organ.

A developmental sequence is thus observable in the architecture of the kidney which may be roughly tabulated thus:

Foetuses less than 0·2 m.	Foetuses of about 0·5 m.	Foetuses of about 1·0 m.	Foetuses of over 2·0–4·0 m. and young whales	Old Adults
Lobes	Lobes	Lobes	Lobes	
	Lobules	Lobules		
		Renculi	Renculi	Renculi

No stages younger than 0·185 m. (*B. musculus*) were examined, but it may be supposed that the kidneys of the very youngest foetus consist simply of a mass (crescentic in transverse section) of undivided kidney substance composed of the earliest capsules and tubules.

It is thus possible to trace the development, as architectural units of the kidney, first of the lobe, then of the lobule, and finally of the renculus, and subsequently to observe their disappearance as the renculi grow into contact with one another.

The capsules and tubules

We have already seen that in the very young stages the kidney substance is made up of intimately entwined tubules with their renal capsules. Collecting tubes run from them towards the central main urinary duct of the organ. Peripherally the kidney substance is beginning to be divided into lobules (Fig. 23). Each lobule at this stage (Figs. 27, 30 *A*) consists of:

(i) Some five or six capsules with their tubules. The number of capsules to a lobule is variable, but it does not usually exceed six. The lobulation, being still indefinite at this stage, does not completely separate the capsules and tubules of one lobule from those of another.

(ii) One or two main collecting tubes running inwards to the central ureter (Figs. 27, 30 *A*).

(iii) One or more embryonic areas where new capsules are in process of formation (Figs. 23, 27, 30 *A*).

(i) The most perfectly formed tubules and capsules are situated in the deeper parts of the lobule (Fig. 27). There are always three or four large well-developed tubules or capsules having glomeruli, which are apparently functional since they contain blood corpuscles. Besides these there are always two or three other capsules less perfectly formed and more peripherally placed within the lobule (Fig. 27 e^1). Their glomeruli are still in various stages of development. The youngest of these stain deeply and contain no blood corpuscles, so that they must be supposed to be not yet functional. In older kidneys, in which renculi have formed from the lobules, the renal capsules are arranged peripherally, and their tubules and collecting tubes are radially disposed within the renculus; in foetuses about 2·0 m. in length they join together to form a common duct, the calyx, and a conical papilla is produced at their junction.

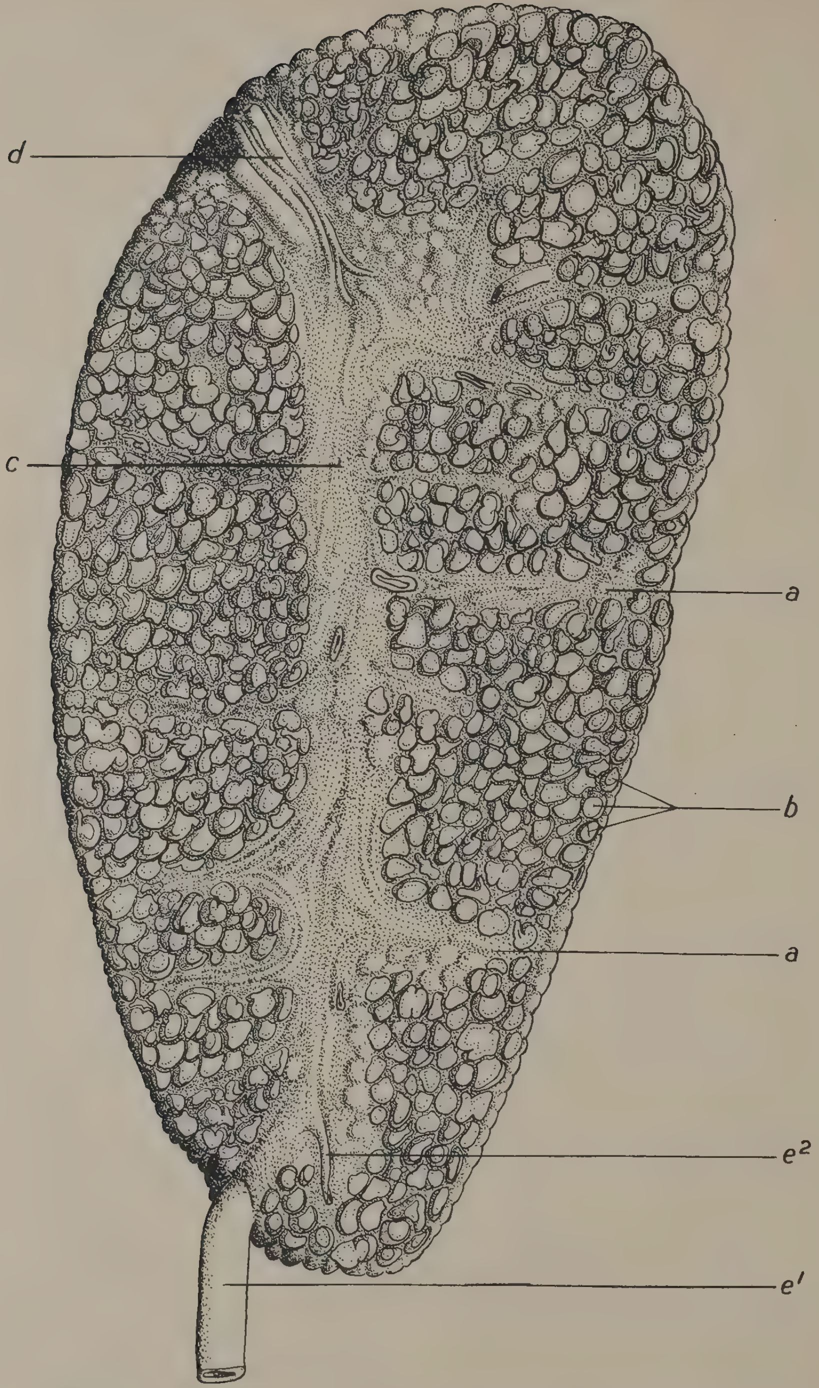


Fig. 26. Longitudinal horizontal section of the kidney of a Fin whale foetus 2·3 m. in length. (× ½.) Ventral view.

The section has passed dorsal to the mesal slit, which is therefore not seen in the figure. Twelve or thirteen lobes are seen. Division into renculi is complete, but the lobules have begun to lose their identity.

a. Interlobar septum.	e^1. Ureter.
b. Renculi.	e^2. Small backwardly directed duct homologized with the posterior calyx major of non-lobulated kidneys (Daudt).
c. Central connective tissue core.	
d. Blood vessels.	

The oldest renal capsules are rounded or oval in shape (Fig. 27 *e*). When seen in sections cut across the glomerular neck, these capsules have a diameter of 30 microns at right angles to the axis of the glomerular neck. In the direction of the axis of the neck the rounded capsules have a diameter of 20 microns, and the oval of 10 microns. They are generally orientated in young kidneys so that the axis of the neck lies along the radius of the renculus, but in older kidneys there is a tendency for them to take up less regular positions. The glomerulus is of the usual type—folded irregularly on a trilobed pattern. It projects into the capsule by a narrow neck (Fig. 27 *e*), carrying the afferent and efferent blood capillaries to the glomerulus. It is often attached secondarily at one or two points to the capsular wall, and is covered by a flat epithelium which also lines the interior of the capsule.

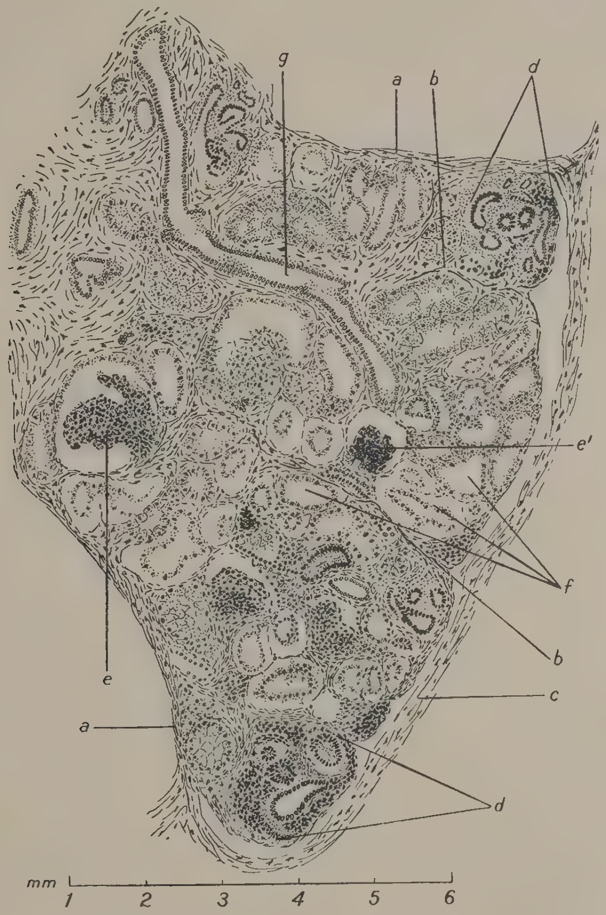


Fig. 27. One lobe of a kidney of a Blue whale foetus 18·5 cm. in length. ($\frac{1}{6}$th obj. × 8 oc.)

a. Interlobar septum.
b. Interlobular septum.
c. Serosa.
d. Embryonic area.
e. Functional glomerulus.
e^1. Young glomerulus probably not yet functional.
f. Urinary tubule.
g. Collecting tube.

The most perfectly formed convoluted tubules seem in the youngest stages to be coiled in an irregular manner (Fig. 30 *A*), influenced apparently by the amount of space available among the surrounding tubules. They are lined by large cubical granular cells with deeply-staining round nuclei and abundant protoplasm. There is a narrowing between the capsule and the tubule, and the cubical epithelium lining the tubule is continued for a short distance into the capsule before it merges with the flat epithelium lining the latter. Between the tubules run intertubular fibrous strands of connective tissue continuous with the interlobular septa.

(ii) Two or more tubules may join together to form a collecting tube, or the tubule may have its own independent collecting tube leading into the main trunk of the lobule (Fig. 30 *A*, *B*).

The collecting tube system of the lobule at this stage (foetuses about 0·2 m. long) usually exhibits a main trunk running inwards towards the ureter from the periphery (Figs. 27 *g*, 30 *A*). It may be joined by one or two main trunks during its course and these main tubes are joined by subsidiary ones from the tubules (Fig. 30 *A*). As already stated, in older kidneys, in which the lobule has split up into component renculi, the collecting tubes converge to a common focal point (Fig. 30 *B*) which becomes the papilla of the renculus; the point of junction forms a cup-shaped pelvis leading into the common calyx (tertiary duct), which in turn passes from the renculus to the secondary duct. At the periphery of the lobule or of the young renculus, the main trunk of the collecting tube enters the embryonic area as will shortly be described, and forks dichotomously once or twice before ending blindly (Fig. 30 *A*, *B*).

The cells of the collecting tube have large clear round nuclei, and less protoplasm in proportion to the size of the nucleus than is found in the cells of the tubular epithelium.

(iii) The blind processes of the collecting tube system (Fig. 30) reach the periphery of the lobule (in very young foetuses) or of the young renculus (foetuses about 1·0 m. long) within what will be called the "embryonic area" of the lobule or renculus. These embryonic areas (Figs. 23 *g*, 27 *d*) are patches of more or less indifferent tissue where new capsules and tubules are formed. The existence of an embryonic area appears to be called forth by the approach towards the periphery of the blind ends of the dichotomously branched collecting tubes (Figs. 28, 29, 30). The tubes appear to cause around their extremities the formation of a mass of deeply staining cells with the potentiality of developing into a capsule or capsules (Figs. 28 A^1, A^2, *B*, 29 *B*). Where the collecting tubes approach the periphery a basin-shaped proliferation of tissue is formed around its tip (Figs. 28 A^1, A^2, 29 *B*, 30 *A*, *B*). Frequently, owing to the proximity to one another of two branches of a fork, two basin-shaped thickenings are formed, joined by their edges (Figs. 28 A^2, 29 *B*). Similar thickenings also seem to occur wherever a collecting tube passes on its course near the periphery of the lobule (Fig. 28 A^1). Thus, at the earliest stage of peripheral differentiation of the lobules (foetuses about 0·2 m. long), the embryonic patches are found distributed around the inner and outer margins of the crescentic cross-section of kidney substance. Later, when the lobules have become more completely separated as architectural units, the embryonic areas are distributed in continuous bands round their peripheries—broken, however, where the partitioning into individual renculi is beginning to take place. This is seen in kidneys of foetuses about 1·0 m. in length. In kidneys of foetuses about 2·0 m. in length, in which the renculi have rounded themselves off from the lobules, the embryonic area forms a continuous but only just discernible band round the outer edge of the cortex. The band becomes less distinct as the renculus grows. In kidneys from foetuses about 3·0 m. long the embryonic areas are no longer found.

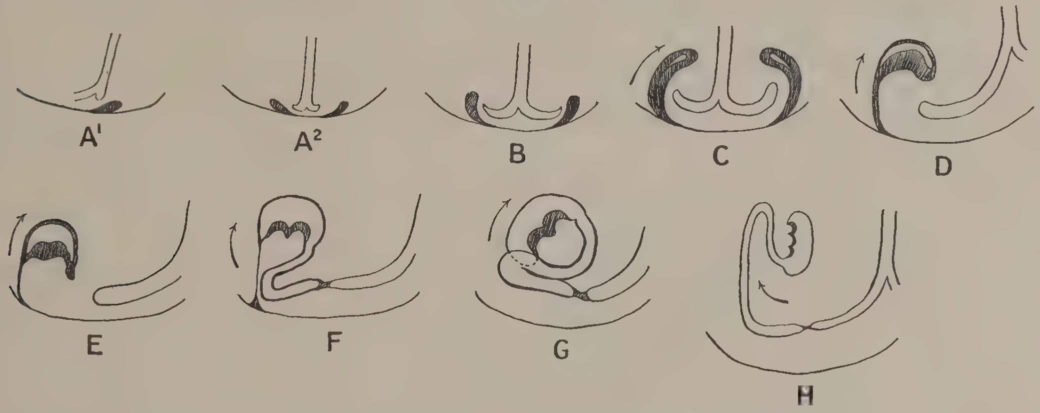


Fig. 28. Diagrams illustrating the formation of the capsule and tubule in the Fin whale.

*A*¹. Collecting tube approaching the periphery of the lobule, producing a thickening of the periphery, the "Anlage" of the capsule.

*A*². A bifurcate collecting tube approaching the periphery, with the formation of two basin-shaped thickenings.

B. A further stage. The "Anlagen" have begun to grow inwards.

C. The cavity has appeared in each "Anlage", as it continued to grow inwards.

D. The "Anlage" has undergone rotation and inward growth. The inner wall of the basin now looks towards the periphery and is beginning to thicken.

E. The young capsule is now connected to the periphery by a slender cord of cells, and the thickened wall shows signs of folding to form the future glomerulus. The collecting tube has meanwhile grown round towards the tip of the young capsule, from which a process is extending to meet it.

F. The glomerular wall of the capsule shows marked folding and the opposite wall of the capsule is thin. A long U-shaped extension has grown out from the capsule to the collecting tube. At the junction of the collecting tube and this extension, which is the rudiment of the future tubule, a thick plug of cells still occludes the canal.

G. A stage farther than *F*. The young tubule has rotated farther in a clockwise direction.

H. Young glomerulus, capsule and tubule, as they appear before their orientation becomes irregular. The glomerular wall of the capsule is now trilobed, and the junction of the tubule and collecting tube is nearly but not quite complete.

Wherever the blind end of a collecting tube approaches the surface of a lobule or renculus it apparently causes the formation of a basin-shaped thickening (Fig. 28 *A*¹) immediately below the surface. Frequently two forks of the same branch approach the surface in close proximity and cause two such basin-shaped thickenings (Fig. 28 *A*²). These are the rudiments of future capsules. The next stage observable in their development (Fig. 28 *B*) involves the extension inwards of one side of the basin, the other side still remaining in connection with the periphery. The inwardly extended portion is

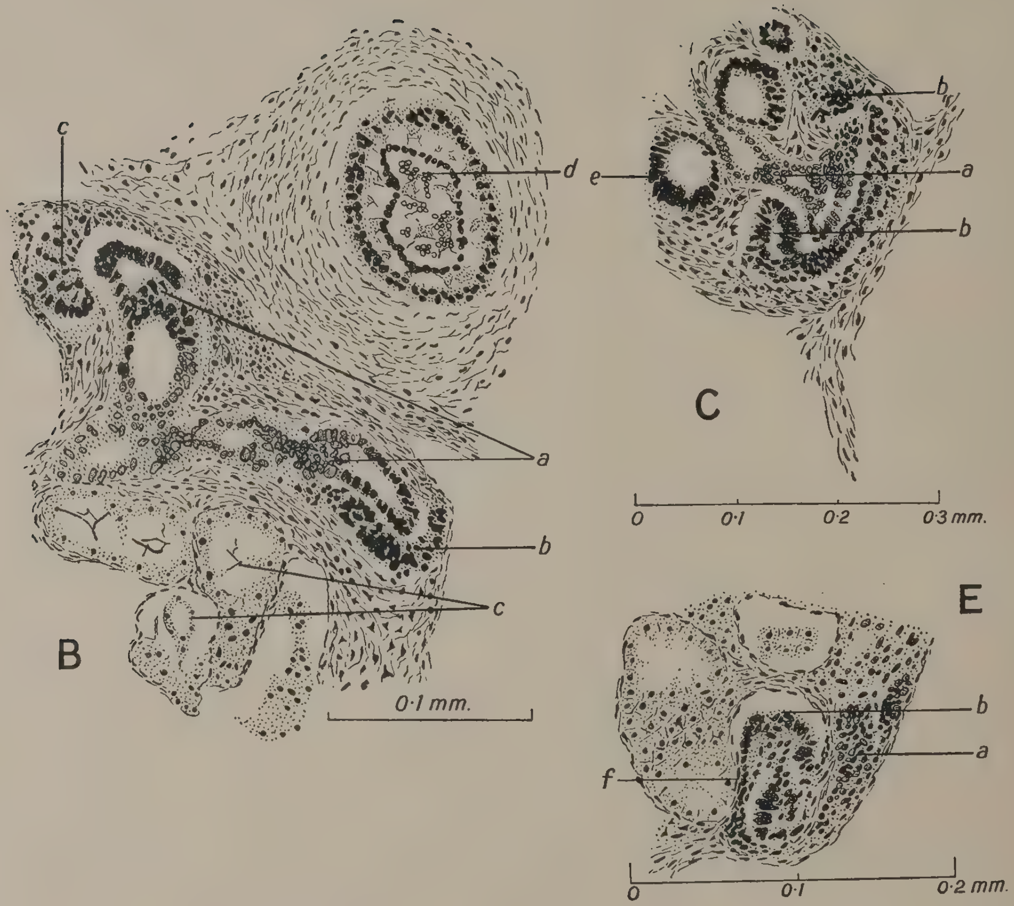


Fig. 29. Stages *B*, *C* and *E* of Fig. 28 shown in greater detail.

B. Two collecting tubes are approaching the periphery and two basin-shaped thickenings have formed. Note that the blind ends of the collecting tubes are deeply stained as are the "Anlagen".

C. The "Anlage" on the left of the drawing is seen to be two-layered and to contain a cavity.

E. The young capsule has rotated inwards and has now a wide cavity: one wall is thin and the other, which will form the glomerulus, is thick and deeply stained. The capsule is still connected by a cord of cells with the periphery (*f*).

a. Collecting tubes.
b. Young capsule.
c. Older tubules in section.
d. Section of an older capsule containing a functional glomerulus.
e. Young tubules in section. Note that they are more deeply stained than the collecting tubes.
f. Cord of cells connecting the young capsule with the periphery.

thick and deeply staining. The blind end of the collecting tube now takes an inward direction (Fig. 28 *C*). In the centre of the inward extension of the embryonic area a slit now appears (Figs. 28 *C*, 29 *C*). It appears in the deepest part of the thickening and grows outwards, producing a basin composed of two layers of cells instead of one (Figs. 28 *D*, *E*, 29 *E*). The thickening grows farther into the body of the lobule or renculus and considerably enlarges, so that the slit becomes a rounded cavity still retaining a slender connection with the periphery (Figs. 28 *E*, *F*, 29 *E*). During its inward growth the young capsule, as shown in Fig. 28, undergoes rotation through 180°, so that the original outer wall of its cavity now faces inwards into the interior of the lobule and thins out to become the future capsular wall. Similarly the original inner wall rotates so as to look outwards. It thickens up and presently begins to show signs of the folding to form the glomerulus (Fig. 28 *E*, *F*, *G*). The tip of the collecting tube now has grown round so as to look slightly inwards towards the interior of the lobule (Fig. 28 *C*–*H*). The capsule is still connected with the periphery by a slender cord of cells, and from the side of the capsule opposite to that at which this cord is attached, a pouch grows outwards towards the blind tip of the collecting tube (Fig. 28 *E*). This is the rudiment of the renal tubule. It elongates, and in its early stages usually exhibits a U-shape (Fig. 28 *F*, *G*), fusing with the end of the collecting tube, where for some time a plug of cells (Fig. 28 *F*, *G*, *H*) still occludes the junction of the two tubes. The cord of cells from the capsule to the periphery is presently severed, the outer (originally the inner) wall of the capsule thickens markedly, and becomes folded in a bilobed, and presently in a trilobed manner—the earliest sign of the future glomerulus. Further rotation of the capsule now takes place, so that the U of the young tubule passes inwards (Fig. 28 *G*) and becomes inverted in position with regard to the periphery. At the end of this rotation the inverted U of the young tubule has widened considerably and the glomerular wall of the capsule is folded in a trilobed manner. Further movements of the capsule and tubule appear to be irregular and governed by the amount of space available to them.

Fig. 30 *A* and *B* were drawn from a series of sections through a young kidney from a foetus 18·5 cm. in length (*B. musculus*) and through an incipient renculus of a kidney from a foetus 0·9 m. in length (*B. physalus*) respectively. Fig. 30 *A* represents the arrangement of the capsules and tubules in one lobe about to form three incipient lobules. The embryonic areas are shown at the peripheries of the lobules, together with young capsules and tubules in various stages. The collecting tubes are shown dotted. It is seen that the tubules run in a complicated and apparently random manner. In the section through the renculus of the 0·9 m. foetus they are beginning to show traces of a radial disposition, foreshadowing the future cortex and medulla.

In older foetal kidneys the capsules are orientated so that their glomeruli in general look centripetally; but in the adult they appear to have lost this arrangement and to lie more or less at random in the cortex, which is traversed by the medullary rays of collecting tubes. These appear in kidneys of foetuses between 2·5 and 3·0 m. in length. The manner in which the renal tubules are coiled was not studied in detail in the

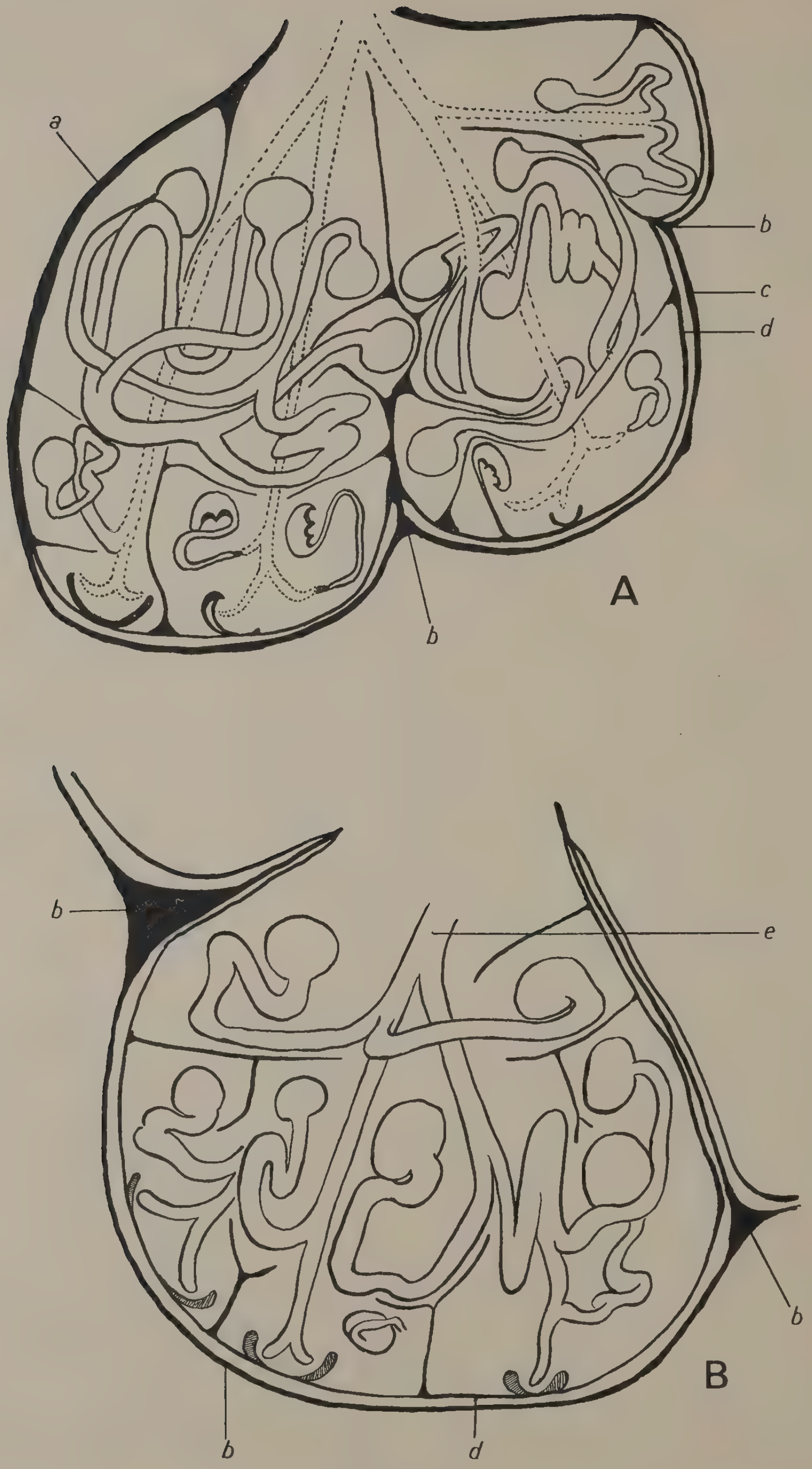

a
b
c
d
b
A
b
e
b
b
d
B

Fig. 30

adult. It appeared, from the examination of single sections, to resemble that found in other mammals—a convoluted portion and an ascending and descending portion were observed.

The vascular supply

The post-caval veins (Fig. 22 f^1, f^2), returning blood from the lumbar regions, run on either side of the dorsal aorta, parallel with it. At a point about one-third of the length of the left kidney from its anterior end, and about half the length of the right, the two post-cavae change their direction. The left member of the pair turns towards the middle line at an angle of about 45°, while the right bends inwards at a slightly smaller angle. The two great veins join to form a common trunk a little to the right of the dorsal aorta (Fig. 22 *e*). The great post-caval trunk so formed runs from its commencement, about one-third the length of the right kidney from its anterior end, and after running for a short distance forwards parallel with the aorta, penetrates the diaphragm to the right and a little ventral of the point of emergence of the aorta (Fig. 22 *e*). The course of the aorta is as usual straight down the mid-dorsal line of the roof of the abdominal cavity.

The renal arteries (Fig. 22 h^1, h^2) are single on each side and run obliquely to their entrance into the kidneys—that on the right side being in advance of that on the left by a distance equal to that which separates the level of the tip of the right kidney from the level of the tip of the left. The renal arteries enter the kidneys on their mesal faces at a point about one-third the length of each from its anterior end. At their point of entrance the arteries are involved in the serous mesentery and form the most anterior point of the mesal slit. Beauregard and Boulart found one large and one small renal artery on each side. In the Cetacea in general there are frequently two renal arteries on each side of equal importance, as in *Hyperoödon* (Bouvier, 1892). In the dolphin (Anthony, 1922) there are two large arteries on the right side and several small ones on the left.

The renal veins (Fig. 22 g^1, g^2) leave the kidneys at the anterior extremities of the mesal faces in company with the arteries. They lie anterior to the arteries and show a distinct tendency towards the plexiform arrangement which appears to be general in the venous system of the Cetacea. There are usually two or three stout veins emerging from the interior of the kidney by the mesal slit, and these are joined by a number of smaller veins from a venous network covering the whole of the outside of the organ within the fibrous investments. The origin of this peripheral network, from lacunae between the serosa and the capsula fibrosa, has already been mentioned (p. 416). The stout veins from the interior and the smaller ones from the superficial network may join together to form a common trunk before entering the postcava, or may enter it severally as one or

Fig. 30. Diagrams to show the arrangement of the capsules and tubules in the Fin whale in: *A*. A lobe with three lobules of the kidney of a Blue whale foetus 18·5 cm. in length. *B*. One young renculus of the kidney of a Fin whale foetus 0·9 m. in length. Note that the capsules are showing signs of their future peripheral disposition.

a. Interlobar septum.
b. Interlobular septum.
c. Serosa.
d. Tunica albuginea.
e. Main collecting tube of the renculus (Tertiary urinary duct or calix).

two major veins accompanied by smaller ones. The renal veins on the left side enter the left member of the pair of post-cavae at the point where it turns towards the middle line and crosses the aorta. On the right side the renal veins enter the common post-caval trunk where it turns forward before penetrating the diaphragm.

It is thus seen that the arteries enter and the veins leave the kidney at the anterior end of the organ and the ureter leaves at the posterior end. Thus the single hilus, which admits both the blood vessels and the ureter in non-lobulated kidneys, has become dissociated in the Cetacean kidney. Anthony (1922) traces this process of dissociation of the hilus from the condition found in the otter, which has a lobulated kidney and in which the ureter leaves from the ventral face of the organ, up to the condition found in the Cetacea, where the ureter leaves the kidney at its posterior end. In the Otariidae, the eared seals, the kidney is only superficially divided and the renal arteries run along the border of the kidney before entering it, while the veins leave from the middle of the mesal border—which is concave. These seals thus have a completely undivided hilus, the ureter leaving from the mesal face. In their general anatomy these seals are the least modified for aquatic life. In *Lobodon carcinophaga* and *Ommatophoca rossi*, which are the most modified for aquatic life, the hilus is tending to be dissociated. The ureter has migrated on to the ventral face of the kidney. In the Cetacea such as *Mesoplodon* and *Ziphius* the ureter emerges about half-way along the ventral face of the kidney, while in Mystacocetes the dissociation of the hilus is quite complete and the ureter leaves the kidney at its extreme posterior end.

It seems quite evident that the degree of fission of the hilus is a function of the degree of lobulation of the kidney, since the hilus is most dissociated in those forms, such as *Balaenoptera*, where the kidney is very finely divided into numerous lobules, and least dissociated in forms such as the Otariidae where the kidney is only superficially divided. Daudt, as will be mentioned again later, laid great stress on a small backwardly directed branch of the ureter found in *Balaenoptera* at the extreme posterior end of the kidney (Fig. 26 e^2) and in *Phocaena phocaena* at about one-third of the length of the organ from its posterior end. Daudt considered that this backwardly directed branch represents the posterior calix major of the kidneys of other mammals, and that the main urinary duct of the kidney represents the anterior calix major. If this is correct then the true hilus of the kidney lies at the junction of these two calices. Actually the whole mesal slit, which is open throughout its length in the foetus, must be looked upon as a greatly elongated hilus, extending from the entrance of the blood vessels at the anterior end of the kidney to the posterior end where the two calices join. Thus the Cetacean kidney is derived from that of the ordinary mammalian pattern by extreme elongation of the anterior calix along an antero-posterior line.

The adrenal bodies (Fig. 22 *i*) are a pair of flat bean-shaped organs (in the adult they are almost circular) lying immediately in front of the renal veins on each side. They receive adrenal arteries mesally and slightly posteriorly. Similarly adrenal veins leave them in the same positions and run to the postcavae slightly anterior to the adrenal arteries.

From the examination of four foetal kidneys (two from a 3·0 m. foetus and two from a 1·8 m. foetus), injected with carmine, it has been found that while the vascular arrangement within the organ shows large individual variations, it is nevertheless always built on a common plan. This is illustrated diagrammatically in Fig. 31. The renal artery, on entering the kidney, is found to exhibit three branches, from which smaller ones ramify

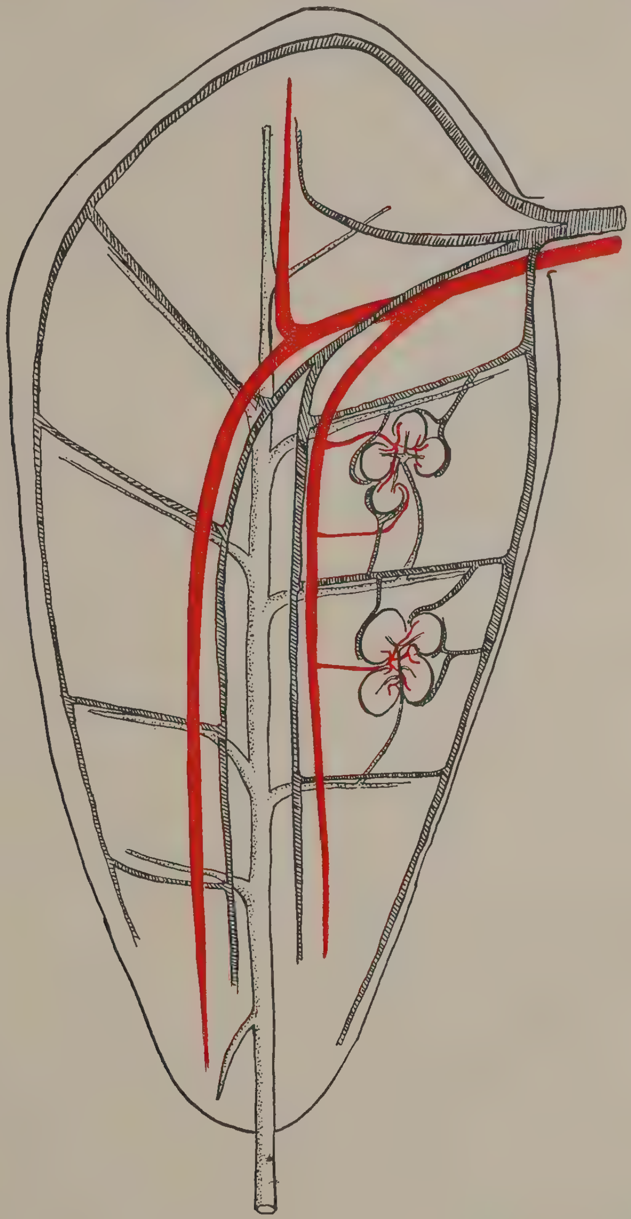


Fig. 31. Diagram illustrating the disposition of the main arteries, veins and urinary ducts within the kidney. (Arteries in red, veins shaded and urinary ducts dotted.)

to the renculi (Figs. 31, 32). The two major branches lie in the same horizontal plane and run posteriorly in the central connective tissue core. The third branch is small and is given off by the distal of the two major branches. It takes a forward direction and supplies the part of the kidney anterior to the point of entrance of the blood vessels. The venous system within the kidney has a twofold arrangement (Fig. 31). In general it may be said that there are two main veins in the central core accompanying the arteries on either side of the main urinary duct. There are usually one or more veins draining the apical region. These form a central venous system for the organ and they are fed by lesser veins from all the groups of renculi bordering upon them and upon the central core. The more superficially placed renculi are drained by veins entering the peripheral network of the organ. This network spreads over the whole surface of the kidney within

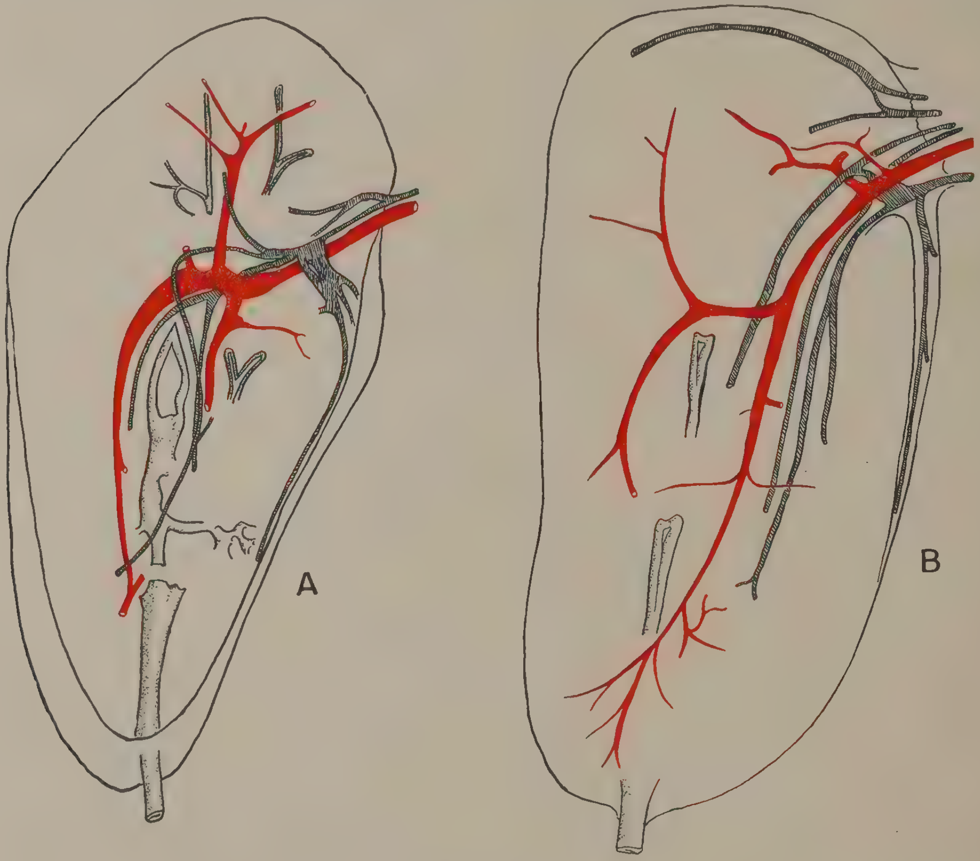


Fig. 32.

A. Main arteries and veins of the kidney (right) of a Fin whale foetus 1·79 m. in length, after injection with carmine.

B. Main arteries and veins of the kidney (left) of a Fin whale foetus 3·1 m. in length, after injection with carmine.

the outer fibrous investments and joins the main renal veins where they emerge from the kidney (Figs. 31, 32), sending also independent small trunks to the postcava. The external network and the central venous system of the kidney are in communication with one another at intervals throughout the length of the organ by means of lateral connecting branches. These correspond roughly to the positions of the interlobar septa, and are roughly parallel with the primary branches of the urinary duct which also have an interlobar position. They also receive branches from the groups of renculi bordering upon them.

The lobes which form the architectural basis of the kidney are thus surrounded by venous arcades, into which smaller veins surrounding the constituent lobules drain themselves. The lobes are penetrated by arteries from the central arterial system, which ramify irregularly among the lobules. Each lobule, consisting of from four to six renculi, receives its arteries from these (Fig. 31).

Fig. 33 represents the appearance of the renculi in a horizontal section of an injected kidney. The renculi, which lie in all directions to the plane of the section, are seen to present very various and irregular outlines, but the grouping of them into lobules of four to six renculi can be made out in the figure. On the right the main arteries and veins of the central system can be seen, and portions of the cross-connecting venous trunks running through the kidney substance. The lower sketch represents two lobes containing two lobules each, while the upper one represents one larger lobe containing perhaps five or six lobules. It can be seen that the arterioles penetrate into the centres of the lobules, together with the secondary branches of the urinary duct, and enter the renculi at their pelves. The venules, on the other hand, run in general round the peripheries of the lobules, so that while the arterial supply to the renculi is intralobular the venous drainage is interlobular. Further, since the kidney lobes are penetrated in all directions by arteries from the central system, the arterial supply to them may be said to be intralobar; but the venous system, whose main channels lie outside the lobes, is interlobar.

Within the renculi themselves (Fig. 34) the arterioles can be seen in injected sections entering on either side at the bases of the pelves. They divide up within the renculus to form the arterial arcade usually found in all mammalian kidneys—a network of major capillaries between the cortex and the medulla. The arterioles of the arcade are surrounded by fibrous tissue and can be seen in section at the apices of the pyramids between the medullary rays (Fig. 34 *a*). Fig. 34 also shows part of this major network within the renculus running in the plane of the section. The capillary supply to the glomeruli is very irregularly distributed; but its general arrangement is based, as Fig. 34 shows, on a series of major capillaries running outwards among the tubules and capsules from the arcade towards the periphery of the renculus, where they anastomose with one another. They give off minute capillaries to the neighbouring glomeruli, and since, in the foetus, the glomeruli are orientated so that their necks are directed centrifugally, these minute capillaries seem to have in general a centripetal direction. The glomerular supply has thus the appearance of a series of festoons of major capillaries from which the minor ones depend (Fig. 34).

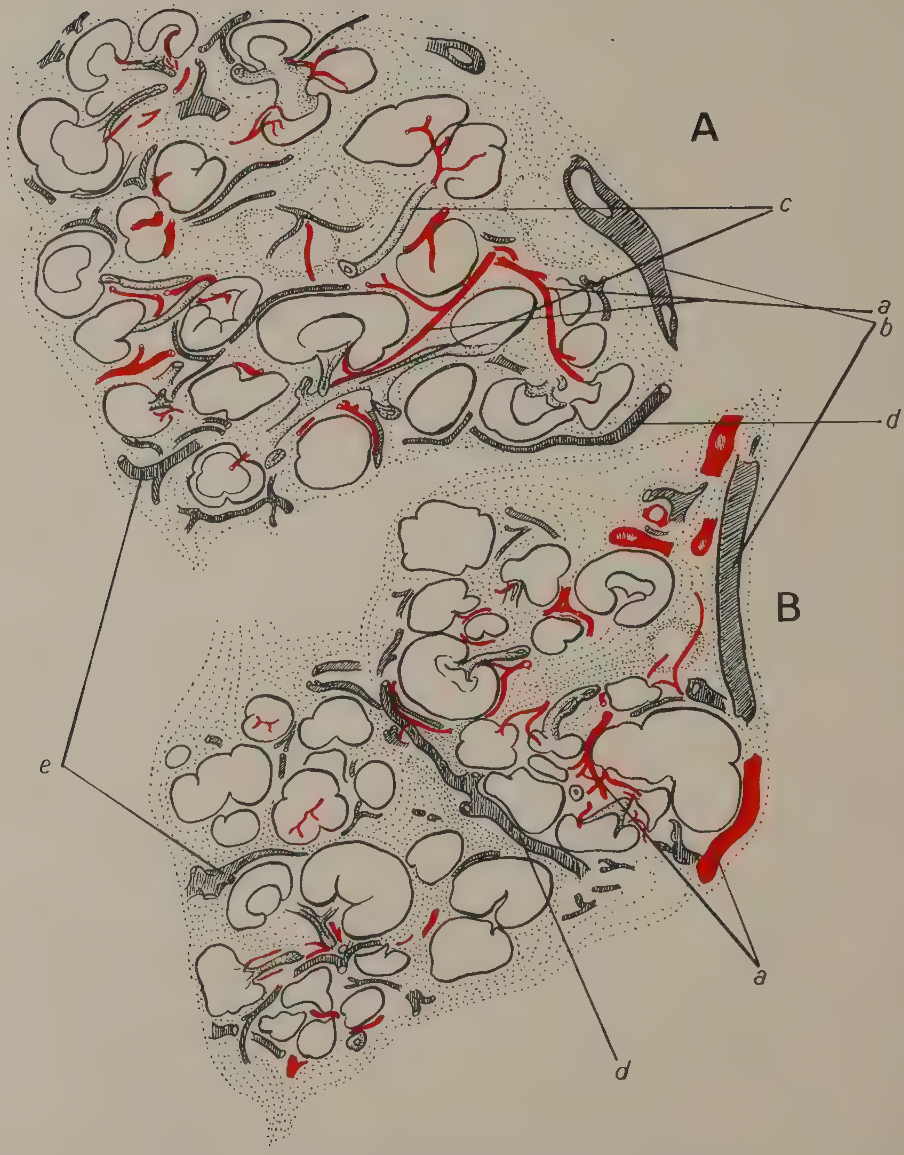


Fig. 33. Horizontal section across the renculi of the left kidney of a Fin whale foetus 3·1 m. in length, after injection with carmine. (Arteries red, veins shaded and urinary ducts dotted.)

A. One lobe containing perhaps five or six lobules. *B*. Two lobes containing two lobules each.

a. Arteries.
b. Main central veins.
c. Secondary urinary ducts.
d. Lateral veins.
e. Superficial veins.

In the smaller of the two foetuses whose kidneys were injected (1·8 m.) the arrangement of the primary capillaries from the major arcade is seen to be wholly irregular. They ran in every conceivable direction, so that the festoon arrangement which appears in older kidneys must be taken to represent a later development. The secondary capillaries to the glomeruli were seen to be directed centripetally in these as in older kidneys (Fig. 34 *C*, *D*).

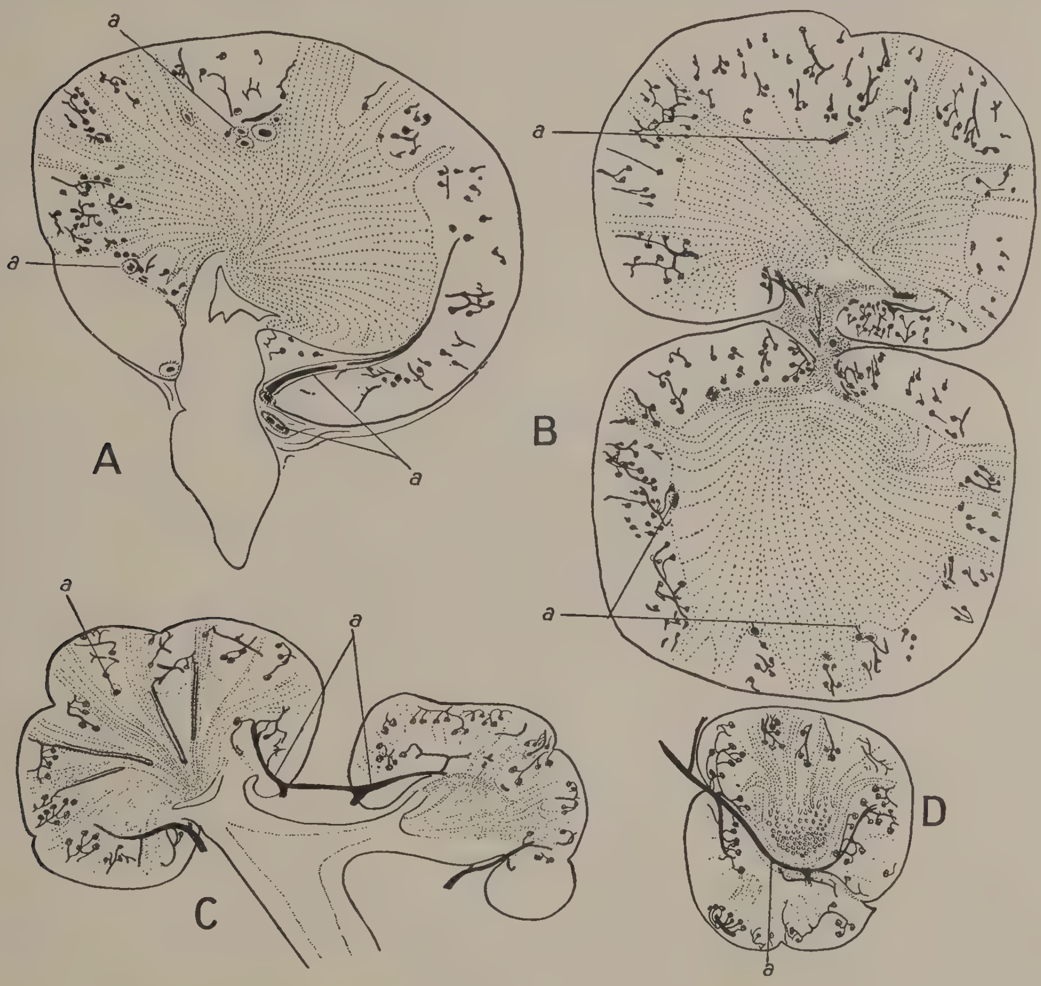


Fig. 34.

A and *B*. Renculi from the kidney of a Fin whale foetus 3·1 m. in length, after injection with carmine. (*A*, × about 10; *B*, × about 8.)

C and *D*. Renculi from the kidney of a Fin whale foetus 1·79 m. in length, after injection with carmine. (Both × about 15.)

a. Arteries of the arterial arcade.

From the primary capillaries others run inwards into the medulla between the uncoiled parts of the collecting tubes. They extend nearly to the papilla between the tubules and then bend backwards upon themselves towards the cortex (Fig. 34 *C*). These medullary capillaries are a common feature of mammalian kidneys.

The injections of the kidneys failed to reveal a regular venous drainage system within the renculi. Many injected sections showed the interstices of the tubules packed with blood corpuscles, which also extended into the tunica albuginea. Outside the renculi sinuous veins were found running over the outer surface of the tunica albuginea to form the interlobular veins.

All other authors who have studied the vascular system of the kidney, Beauregard most especially, have found efferent veins exactly corresponding to the afferent arteries leaving the renculi on either side of their pelves. In the present work these were not found either in any foetal or adult kidney.

THE URINARY DUCT

The main urinary canal of the kidney runs in the central core of the organ (Figs. 23, 24, 25, 26) and receives primary branches from the interlobar septa. These receive secondary branches from the lobules, and these again are made up of the junction of a number of tertiary ducts (calices) from the renculi. Since the primaries occupy the interlobar septa they have a roughly segmental disposition, corresponding to the lobes between which they run. The ducts themselves are composed of tough fibrous tissue, lined by a cubical epithelium continuous with that of the collecting tubes of the renculi and of the calices (tertiary and secondary ducts).

Mention must be made, however, of a small branch of the urinary duct, the importance of which was especially emphasized by Daudt. It was mentioned before that author by Hyrtl (1872), who attached no particular significance to it. At the extreme posterior end of the kidney in *Balaenoptera* a small branch runs backwards (Fig. 26) and ventrally from the main urinary canal towards the extreme posterior tip of the kidney, receiving secondary ducts on its course. In *Phocaena phocaena* this branch comes off about one-third of the length of the kidney from the posterior end, while in *Delphinapterus* and *Hyperoödon* (Daudt) the forking is more evident and the subsidiary branch, much larger than in *Balaenoptera* and *Phocaena*, comes off from the main duct in the middle of the kidney. These backwardly directed branches, Daudt believes, represent the posterior branches of the calix major of the kidneys of other mammals, while the main urinary duct represents the anterior calix major of a non-lobulated kidney. Thus the process of lobulation of the kidney in the Cetacea has involved the great elongation of one branch only of the calix major at the expense of the other. If this is correct the hilus must be taken to be represented by the whole of the mesal slit, extending from the blood vessels anteriorly to the emergence of the ureter—the junction of the two calices—behind.

THE BLADDER AND URETER

In the foetus the bladder is represented only as a swelling on the umbilical cord (Figs. 1, 12, 21, 22), in which the umbilicus enlarges to form a cavity with longitudinally folded walls. The vesica urinaria so formed has a fairly flat external surface ventrally and a domed dorsal aspect. It lies between the lower poles of the kidney and is flanked by the testes in the male and the ovary in the female. In ventral view its neck overlies the vasa deferentia and the broad ligament which carries them in the male, and the corpus uteri and vagina in the female. The two hypogastric arteries ascend on to the latero-ventral face of the vesica and converge upon its ventral face (Figs. 1, 12), becoming surrounded by thick muscular sheaths completely apposed to one another where the umbilicus meets the ventral body-wall. The ureters, after leaving the kidney, pass backwards and inwards in an oblique direction towards the neck of the bladder. During this part of their course they are completely hidden under the great fibrous pad which occupies the dorsum of the inguinal region of the abdominal cavity. They emerge from their peritoneal coverings anterior to the hypogastric arteries and turn ventrally and medially on to the wall of the neck of the bladder. Upon the neck of the bladder they proceed forwards for a very short distance, and then penetrate into the fibrous investments to open into the bladder close to one another on the dorsal side of the cavity. The openings of the ureter are oval and are separated by a longitudinal fold of mucous membrane. During the straight part of the course of the ureters these ducts are lined by a longitudinally folded cubical epithelium, continuous with that which lines the main urinary duct of the kidney, and surrounded by a similar tough fibrous investment. Where the ureters ascend, however, on to the neck of the bladder the longitudinal folding of their lining epithelium is replaced by a folding of a more complex nature. The folds become compound and each consists of a main longitudinal crest with regularly spaced lateral subsidiary projections on each side of it, so that the canal becomes lined by a number (about half a dozen) of pinnate ridges.

The bladder itself has extremely thick muscular walls so that in the foetus the internal cavity is comparatively very small. It is lined by a membrane, thrown into longitudinal folds which disappear at about the level of the openings of the ureters, so as to leave the lining of the neck smooth and unfolded. Near the verumontanum, as already described, a median dorsal ridge rises up to form the crista urethrae.

In the adult the bladder is very elastic and when empty or nearly so—as it always is in whales drawn up on the flensing plan—it forms a comparatively very small sac, lined by an abundantly folded membrane, at the posterior angle of the abdominal cavity.

DISCUSSION

It is not intended in this paper to deal at length with the much discussed question of the relationships of the Cetacea to other groups of mammals. This question and that of the origin of the groups has already been examined in detail by Weber (1886 and 1904), Gregory (1910), Winge (1921), Kükenthal (1922) and Anthony (1926). It is, however, proposed to make comparisons between the urino-genital systems of both sexes of the Cetacea and those of other mammals, in the hope that perhaps such comparisons may throw light on the relationships of the order.

It might be expected that the affinities of any group of animals would be shown forth more clearly by some such set of organs as the genital system, rather than by such parts as the skeleton, limbs or teeth, which are the most directly influenced by the animal's immediate environment. The viscera will tend to remain constant in their morphology, while the parts of the body in more direct contact with the environment are undergoing evolutionary changes.

The urino-genital system of the Cetacea presents many extremely primitive and striking features which it is one of the aims of this paper to emphasize. In the female system the following may be noted:

(i) The ovary lies free upon the ligamentum latum and is not enclosed in a peritoneal sac. This may be taken to be a primitive character, since the development of any sort of covering must be a specialization. The absence of any such covering, however, is rare among mammals. In Monotremes there is a pouch formed by a ligament connected to the peritoneum which forms the ovarian capsule, and in the camel, among Artiodactyle Ungulates, the ovary lies in a pavilion provided by the oviducal funnel. This has been noted also in some Cetacea. In the Ruminants the ovary is lodged in a recess or sacculus of the broad ligament as reported by Turner (1870 *b*) for *Orcinus*. In other groups of mammals the ovaries are enclosed, sometimes completely, in a peritoneal sac or "tentorium".

(ii) The ovary is suspended in the abdomen by means of a plica diaphragmatica, attached to the body wall lateral to the kidney and extending nearly to the diaphragm. This is the primitive method of attachment of the mammalian gonad, and is found best expressed in Monotremes and Insectivores.

(iii) Multilobulation of the ovary. Anthony (1926) pointed out that this is a primitive character found in many other mammals. The polyoestry—shedding of the ova outside the usual breeding season—is also a primitive character.

(iv) The complete absence of accessory glands. This is also a feature of the male system.

Besides these characters, which may be regarded as primitive, there are others which, while not primitive, are shared by other groups of mammals and are distinctive of the Cetacea and of those groups.

In the female system the following may be noted:

(i) The uterus bicornis, short corpus uteri and the absence of a well-defined os uteri have already been mentioned. The presence of a uterus bicornis is a fundamental character and narrows the comparison down to three groups of mammals which also have this form of uterus—namely the Insectivora, Carnivora and Ungulata. The short corpus uteri and the presence of the circular folds in the vaginal wall are found, among these groups, only in Insectivores and some Perissodactyle Ungulates (Rhinoceros). In the camel among the Artiodactyles the uterine wall is folded at the union of the uterus and vagina, but there is no folding of the wall of the vagina itself. In other Artiodactyles there is a well-marked os and no folding of the vaginal wall.

(ii) The separation of the urinary and genital openings. As has already been stated this occurs in some Insectivores, many Rodents and some Prosimiae. In all these groups, however, the condition found is that known as the "perforate clitoris". In the Rodents a urethral canal is formed by the ventral convergence of two flaps of the clitoric prepuce, making a channel along the ventral side of the clitoris continuous with the urethra. In the Insectivora and Prosimiae the clitoris itself is perforated by a urinary canal which traverses the glans. In the Cetacea, however, the clitoris is not perforate and there is no overlapping prepuce. There are indications of a short common urino-genital canal in the foetus. In the adult the clitoris projects outside the vulva so that the two openings—the urinary and the genital—become widely separated. In this respect it is suggested that a derivation of the Cetacean condition from some groups of Insectivora might be imagined such, for instance, as *Tupaia* where the urethral opening is situated just within the vulva. In the mole the clitoris projects from the vulva but is perforated by the urethra. In many Ungulates also a projecting clitoris is found but there is always a urino-genital canal.

(iii) The presence of a longitudinal fibrous band across the opening of the vagina (the vaginal band). This has already been compared with the "hymen" of the mare (p. 394).

In the male system also an assemblage of primitive characters is found.

(i) The form of the prostate. The prostata is not strictly speaking a prostate gland at all, but a diffuse assemblage of urethral glands opening along the dorsum of the urino-genital canal. This primary unlocalized condition of the glandulae urethrales is found, as already stated, in Monotremes and Marsupials.

(ii) The absence of accessory sexual glands. This is a character seen in many Insectivores—a group, however, which shows within it many transitional stages, from complete absence of one or other of these sets of glands to full development of all of them. Cowper's glands are generally present in Insectivora. In some Carnivores they are absent—notably the Arctoidea and Pinnipedia. The absence of anal glands is a feature of the Ungulates.

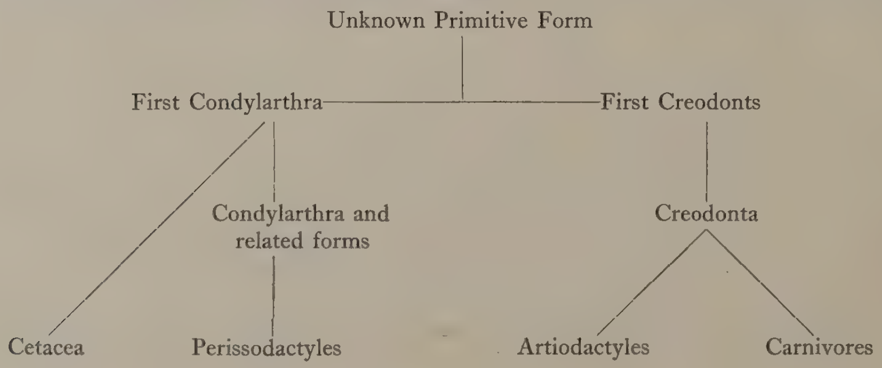
(iii) The intra-abdominal position of the testis has already been under discussion (pp. 387, 388). It has been suggested that the testicondy of the Cetacea is secondary, but possibly derived from an incomplete testicondy in which the testis originally descended to a position in the posterior part of the abdominal cavity outside the inguinal ring. Such a condition as this exists in the foetal ox before the full descent into the cremaster sac takes place. It is suggested that a cremaster sac originally existed in the Cetacean forerunner in view of the occurrence of such a sac in *Mesoplodon*. Attention has been drawn to the extremely primitive nature of the ligamentous attachments of the testis, which take the form of a central ligament comparable to the ligamentum of the female and of a plica diaphragmatica. It is the nature of these attachments which compels the belief that the testes have never deserted their original position to the extent of a full descent into a scrotum.

(iv) It is assumed that the development of a two-horned uterus masculinus such as is found in some Cetacea—particularly *Mesoplodon*—must be looked on as a primitive character, representing a condition of "pseudo-hermaphroditism" further accentuated in the Cetacea by the similarity between the male and the female ligamenta lata and the position of the testis. This "pseudo-hermaphroditism" reaches its maximum expression in the Mammalia among the Rodents, but among the Ungulates it is also found. The horse, donkey and zebra all have a Müllerian system developed as a long vagina masculina like that of the Narwhal, bifid at its tip; while the goat and reindeer have long Müllerian ducts like those of *Mesoplodon*.

(v) The absence of seminal vesicles. Since there is no convincing evidence that the small sacs described by various authors on the vasa deferentia really represent reduced seminal vesicles, it may be assumed that the vesiculae seminales are not merely secondarily absent from the Cetacean system. The absence of these organs may be assumed to be more primitive than their presence, especially as they are absent in the Monotremes. The Pinnipede Carnivores also lack seminal vesicles.

The retraction of the penis into a penis sac by means of a pair of retractor penis muscles is perhaps the only specialized character observable in the male genital system of the Cetacea; it relates the system to that of the stallion in which a similar pair of retractor muscles is found and the penis becomes withdrawn into a sac in the inguinal region.

After the above short comparative summary of the genital system of the Cetacea it will be seen that, besides many extremely primitive characters indicating not necessarily origin from, but affinity to some very primitive Insectivore-like mammal, the greatest number of points show resemblance to the Ungulata, especially the Perissodactyles. As pointed out by Anthony (1926) the Cetacea further resemble the Ungulata in having a non-deciduate diffuse placenta; while the Carnivora, which show many points of resemblance in their general anatomy to the Cetacea and which, on account of the Creodont-like nature of the earliest fossil Zeuglodons, may claim affinity to the Cetacea, have a deciduate zonary placenta. Further, while the Carnivora bear at least two young at a time and frequently bear their young in large litters, the Ungulates and Cetacea bear almost always a single young at a birth, and while the gestation period of the Carnivora is short, that of the Cetacea and Ungulata is long (dog, 60 days; cat, 56 days; tiger and lion, 108 days; horse, 347 days; cow, 290 days; deer, 284 days; sheep, 150 days; *Balaenoptera*, 10–12 months; *Orcinus*, 12 months; *Delphinus delphis*, 300 days). Anthony, who relates the Cetacea to the early Condylarthra, suggests some such relationship as the following:



Weber (1886), however, while deriving the Cetacea from some very primitive proungulate source says (p. 240): "Ich halte es für ganz unrichtig die Cetaceen entweder von Carnivoren oder von Ungulaten abzuleiten. Meine Meinung geht dahin dass sie einem generalisirten Säugethiertypus in Mesozoischen Zeitalter entstammen der zwischen Carnivora und Ungulata mitten inne steht".

With regard to the lobulation of the kidney, all authors, notably Daudt (1898) and Anthony (1926), who have discussed its significance, agree that it is related to the necessity for an increase in the excreting surface of the kidney in correlation with (*a*) the great volume of a whale in comparison with its surface and (*b*) the greater amount of excretion carried out by the Cetacean kidney in comparison with that of other mammals. Daudt, in the latter connection, points out that a whale's diet has an exceptionally high water content, whether it be crustaceans or fish (rorquals) or cuttle-fish (sperm whales), and further that quantities of sea water are probably engulfed with the food, the salts of which will tend to promote the excretion of urine. This author also remarks that the skin is entirely devoid of sweat glands, so that the excreting function of the skin is probably taken over by the kidneys. Anthony draws an analogy between the increase in the excreting surface of the kidney of the Cetacea brought about by lobulation and the increase in the number of cellules in the neo-pallial cortex brought about by gyrencephaly in the higher mammals.

Quite evidently, at any rate, the lobulation has a purely physiological significance. It is found also in the otter, where it is probably an adaptation to aquatic life, the bear and the elephant, where it is probably correlated with the surface-volume ratio. It is also found in seals where again it is probably an adaptation to aquatic life.

SUMMARY

Some description of the male genital system of the Fin whale (*Balaenoptera physalus*) has been given from the dissection of two foetuses 2·65 and 1·23 m. in length respectively.

The main points in the anatomy of the genital system are the following:

1. The smooth conical penis is retractile into a ventral pouch by means of a pair of retractor penis muscles.
2. The penis is surrounded proximally by a muscular sheath derived from the panniculus carnosus.
3. The penis contains a single aseptate corpus cavernosum forming a crus at the base of the penis. It is accompanied by a single corpus spongiosum, which forms no crus and no bulb. The corpora cavernosa and spongiosa continue together into the terminal cone, which is therefore not a true glans.
4. The crus corporis cavernosi is embraced by an ischio-cavernosus muscle (erector penis) whose attachments to the ischiac portions of the pelvic bones are small. The interpelvic ligament of Struthers exists, but is small and poorly developed in the Fin whale. The triangular ligament of Struthers was found.

5. The prostata has the form of a series of glandulae urethrales opening diffusely upon the dorsum of a part (pars pelvica) of the urino-genital canal surrounded by a compressor prostatae muscle.

6. There are no Cowper's glands and no vesiculae seminales.

7. The testes are abdominal in position and are suspended in the body cavity by a broad ligament, similar to that suspending the ovaries in the female. A plica diaphragmatica extends lateral to the kidneys on each side of the body.

8. The urinary duct opens upon the verumontanum by a small pore which is closed by a crista urethrae.

9. No uterus masculinus was found, although other authors have described it in the Fin whale as a small pit upon the verumontanum near the seminal pores. In the Cetacea in general the Müllerian system is represented in a variety of ways, from a small sac-like depression (*Kogia breviceps*) to a two-horned structure (*Mesoplodon*) resembling a uterus bicornis.

The vascular supply was described. This is largely obscured by the development of a large inguinal plexus.

Some account of the female genital system of the Fin whale was given from the dissection of two foetuses, 2·1 and 1·73 m. in length.

The main points in the anatomy of the female genital system are:

1. The external genitalia are contained in a genital slit on the ventral abdominal surface which has been called the vulva. It is bounded by two swollen lips which have been called the labia majora. The vulva is surrounded by a sphincter-like musculo-fibrous mass composed of the interpelvic ligament, the levator ani and the panniculus.

2. The urinary and genital apertures are separate, but the clitoris is not perforated.

3. A finger-like clitoris, between two labia minora, overhangs the urinary opening. It may be compared with the male penis turned backwards through 180°, so that its anterior face looks backwards and its tip upwards. The clitoris contains rudimentary cavernous bodies.

4. The mammary glands are tubulo-racemose glands embraced by a compressor mammae muscle. The nipples are inguinal in position and are "pseudo-nipples".

5. The ovary lies free on the ligamentum latum and is not enclosed in any sort of sac or pavilion.

6. The oviducal funnel has a fimbriated edge.

7. The uterus is a uterus bicornis and the corpus uteri is short. There is no well-marked os uteri.

8. The vagina is long and is provided with circular funnel-like transverse folds in its upper part. At its opening into the vulva it is provided with a sphincter vaginae muscle.

9. The opening of the vagina is frequently obstructed in the virgin by a fibrous "vaginal band", which becomes ruptured at coition and persists as a tag-like remnant.

Mention has been made of the nervous supply to the urino-genital region. A main lumbo-genital nerve comes off from the 10th, 11th and 12th lumbar spinal nerves.

A central hypogastric ganglion lying dorsal to the neck of the bladder is connected with the lumbo-genital nerve by a plexus in the inguinal region.

An account of the structure of the kidney has been given. The main features are:

1. The kidney is a composite organ, oval in shape and triangular in cross-section, made up of a great number of small unipyramidal kidneys (renculi) grouped together in lobules of four to six renculi. The lobules are again grouped together in larger aggregations or lobes. As the renculi increase in size the lobules tend to become obliterated as architectural units of the kidney. Finally the lobes tend to become obliterated also.
2. The renculi drain into a main urinary duct running through the centre of the kidney by tertiary, secondary and primary branches.
3. The arterial supply to the renculi is afforded by renal arteries, which branch within the kidney and run to the renculi. The veins from the renculi drain either into a system of main veins within the kidney, or into a superficial network which ramifies within the fibrous investments. The two systems—the deep and the superficial—join outside the kidney to form the renal veins.
4. There are two fibrous investments to the kidney: an outer serosa, and an inner capsula fibrosa which extends into the organ among the lobules. Each renculus is covered by its own tunica albuginea.
5. A slit running down the mesal face of the kidney represents the hilus.

A short comparative summary has been given and it has been demonstrated that while the genital system of the Cetacea shows many primitive features, which suggest affinity to some near-insectivore group, there are, nevertheless, reasons for comparing the genital system of the Cetacea with that of the Ungulates (especially the Perissodactyles).

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APPENDIX

DIMENSIONS AND GROWTH OF THE KIDNEY OF BLUE AND FIN WHALES

DIMENSIONS OF THE WHOLE EXTRACTED ORGAN

Adult whales

Measurements of three dimensions of the adult kidney were taken on the flensing platform. Only the left kidney could be measured, since the right was never accessible during the dismemberment of the carcass. When the body and viscera were being stripped away from the vertebral column it was found possible to detach the left kidney by cutting through its serous mesentery and to measure it as it lay on the platform.

The measurements taken were:

The length between the two tips (anterior to posterior).
The greatest breadth: at about the mid-point along the length.
The greatest depth: at about the same point as the breadth.

The adult kidney exhibited considerable variations in shape, sometimes because it was in a more or less advanced state of decomposition, and frequently because of the thick accumulations of fat in the fibrous investments. Its usual shape, however, was similar to that of the foetus: namely, very roughly semicircular in outline with its greatest breadth at about half its length, and triangular in cross-section. There was a long latero-ventral and latero-dorsal side and a narrower mesal side. The measurements were not taken on decomposed kidneys.

The numbers of kidneys measured in this manner were as follows:

Fin whales	Males: 193.	Females: 159.
Blue whales	Males: 15.	Females: 26.

In Tables I and II are shown the measurements of whales of length differences of 1·0 m. The number of measurements of which each figure is an average is also shown in the Table.

The length of the left kidney of Fin whales is about 1·0 m. when the body length is about 14·0 m.—that is soon after weaning. In the largest Fin whales examined (24·0 m.) the length of the left kidney was about 2·0 m. There is no marked difference between the average lengths of the kidneys of Blue and Fin whales of the same body length. The width and depth of the organ, however, are considerably greater in Blue than in Fin whales of the same length—a difference which is especially marked in the female sex. The numbers of Blue whales of any length, however, were too small to permit a more definite statement than this to be made.

The measurements seem to show that while the length of the kidney is related directly to the length of the body, the width and depth of the organ are related to the girth of the whale—or rather, possibly, to the amount of space available in the body cavity, which will, indeed, be dependent on the animal's girth. A Blue whale has a considerably greater volume than a Fin whale of the same body length.

It must be remembered, however, in considering these measurements, that there is immense variation in the dimensions of the kidneys, and that these figures are averages and are thus only representative for body lengths for which the greatest number of measurements has been taken. For Fin females these lengths are 20·0, 21·0 and 22·0 m. and for Fin males 18·0, 19·0, 20·0 and 21·0 m. Among Blue whales the numbers of kidneys examined for each body length were small, so that the measurements are less representative than those for Fin whales. The extent of the variations which may occur are illustrated by the following eight measurements taken at random from the measurements of the kidneys of female Fin whales of 22·0 m. body length (left kidney only).

Length, cm.	Breadth, cm.	Depth, cm.
215	65	17
180	62	21
215	70	22
168	80	15
134	60	28
210	70	25
155	56	22
175	56	18

It is seen that in general an excess in one dimension is compensated for by a deficiency in another and *vice versa*. The depth appears to be the most constant measurement.

No sex differences in the dimensions of the kidneys were discernible either in Blue or Fin whales.

In Tables I A and II A the proportions of the kidney are shown worked out as ratios of length : breadth : depth and of length : breadth. These ratios, again, are only representative for those body lengths for which the greatest number of measurements was made. The length-breadth-depth ratio shows that, compared with the depth, which is seen by Tables I and II to be fairly constant, by far the greatest increase takes place in the length of the organ—the ratio of the length to depth undergoing a fairly steady and appreciable increase. The ratio of the breadth to the depth increases less markedly. In general, however, the proportions of the kidney remain fairly constant, and the ratio length-breadth remains remarkably constant throughout the series. In relation to the depth the length of the organ seems to show a greater individual variation than the breadth. The length of all kidneys, both Blue and Fin, is about three times the breadth. The proportions of the kidneys of Blue and Fin whales are very similar. For females of both species the average ratio is:

Length : breadth : depth ... 7 : 3 : 1
Length : breadth ... ... 3 : 1.

In order to compare the sizes of kidneys with one another, an index of size was obtained for the measurements for each body length by multiplying the three dimensions together and dividing the product by 10,000 in order to bring the number to a manageable size. These numbers (kidney numbers) do not, of course, represent volume, but size, and have no absolute but a comparative value. Even the comparative value of them is somewhat limited since kidneys with a greater depth than usual, but perhaps a smaller length, will have a disproportionately large size number and *vice versa*. In general, however, these numbers will give a fair representation of the sizes of the kidney.

In Fig. 35 the kidney numbers are shown plotted against the body lengths. The kidney numbers are derived from the figures given in Table I. Only Fin whales have been dealt with, since the numbers of Blue whales examined for each body length were too small.

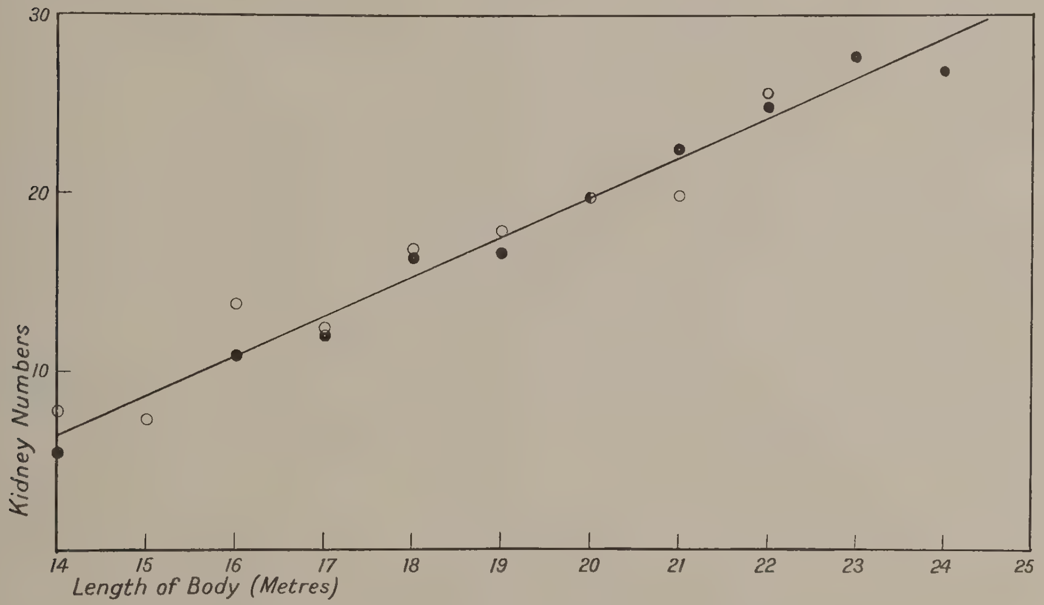

Fig. 35. Adult Fin whales. Length of body and kidney numbers (left kidney).

The figure resulting from the plotting of the body lengths against the kidney numbers is a straight line. The points for both sexes (● = male, ○ = female) fall upon the same line. The growth rate is the same, then, in both sexes, and for a given increment in the body length there will be the same increment in the size of the kidney at all stages during the growth of the body. The growth rate of the kidney is even and continuous until full physical maturity, when the body ceases to grow. Further, as seen from Table I A (and II A for Blue whales), the growth of the kidney consists in an increase in length primarily, breadth secondarily and depth scarcely at all—a feature of the growth of this organ commented upon by Beauregard and Boulart and by Daudt. The length of the organ is dependent upon the length of the body, while the other two measurements appear to be related to the girth of the body.

Foetuses

A series of measurements similar to those taken upon adult kidneys has also been collected for foetal kidneys. The figures are given in Tables III and IV. These figures are not averages but single measurements and include kidneys from both sides of the body, so that the right and left organs can be compared. All three dimensions are seen to increase rapidly with the length of the foetus. On the whole, among male Fin foetuses, the left kidney is shorter than the right by an amount varying from 1·5 to 2·5 cm. The average difference for the thirteen foetuses in which both kidneys were measured is 1·5 cm. Among female Fin foetuses this difference is not so apparent. Among Blue whales (Table IV) the difference is apparent in the two female foetuses whose kidneys were measured, but among male Blue whales no figures for the right kidney have been obtained. There appears to be no constant difference between the breadth or depth of the kidneys of the two sides of the body.

The ratios length-breadth-depth and length-breadth are shown for foetal kidneys in Tables III A and IV A.

The chief point brought out by these figures is the greater comparative breadth and depth than in the adult. The length of the right kidney of male Fin whale foetuses is six times the depth and two and a half times the breadth, and the breadth is only two and a quarter times the depth. On the left side the length of the organ is only about five and a half times the depth and two and a quarter times the breadth. Similar differences between the ratios for the adult and foetus are observable in the female sex (Fin whales). In Blue whales the increased depth of the foetal kidney is even more noticeable (except in the only two male foetuses examined).

The foetal ratios may be stated roughly as follows:

	Right		Left	
	Length : Breadth : Depth	Length : Breadth	Length : Breadth : Depth	Length : Breadth
Fin males	6 : 2¼ : 1	2½ : 1	5½ : 2¼ : 1	2½ : 1
,, females	5½ : 2 : 1	2½ : 1	5¾ : 2¼ : 1	2½ : 1
Blue males			7 : 2½ : 1	2½ : 1
,, females	6 : 2½ : 1	2¼ : 1	5 : 2¼ : 1	2¼ : 1

In Fig. 36 the foetal kidney numbers (obtained in the same way as in the adult and comparable with them) are plotted against the body length of the foetus. The growth curve of the kidney is now seen to be of the usual shape, showing a gentle slope at first and becoming gradually steeper. Great acceleration of growth takes place in foetuses between 1·0 and 3·0 m. in length. If Figs. 35 and 36 could have been plotted on the same scale the lines would have been continuous with one another, but owing to the rapid increase with the body length of the kidney measurements in the foetus and to their much slower increase in the adult, the curve would have undergone considerable flattening in its upper or adult part.

WEIGHT OF THE KIDNEY

A few kidneys of small Fin whales were weighed (Table V) on the flensing platform. After the left kidney had been removed from the body it was cut up into manageable sections and weighed piecemeal with a spring balance. The method is, of course, only a rough one. A certain amount of the serous mesentery was inevitably adherent to the organ, so that each of these weighings is probably in excess of the true value. The weighings were of necessity carried out in a very short time and under considerable difficulty.

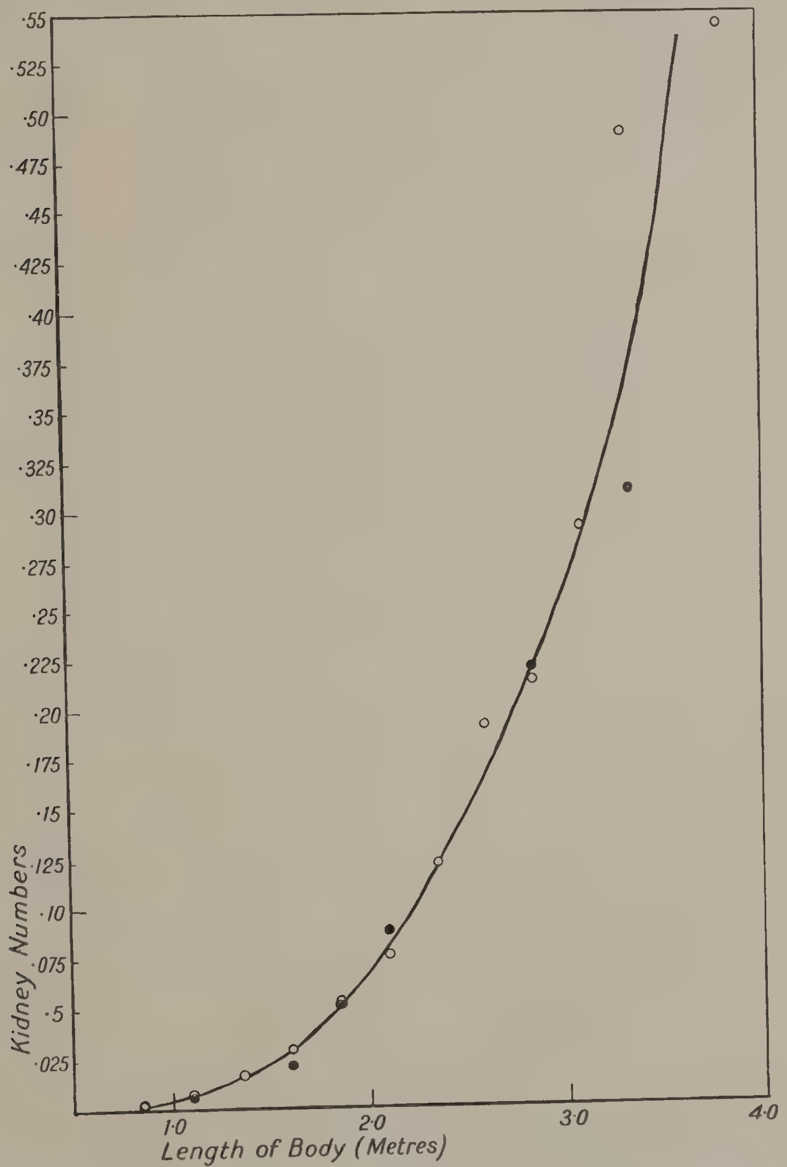

Fig. 36. Foetal Fin whales. Length of body and kidney numbers (left kidney).

The kidneys of five male Fin whales were weighed. Only one was sexually mature. One immature female Fin whale was also dealt with.

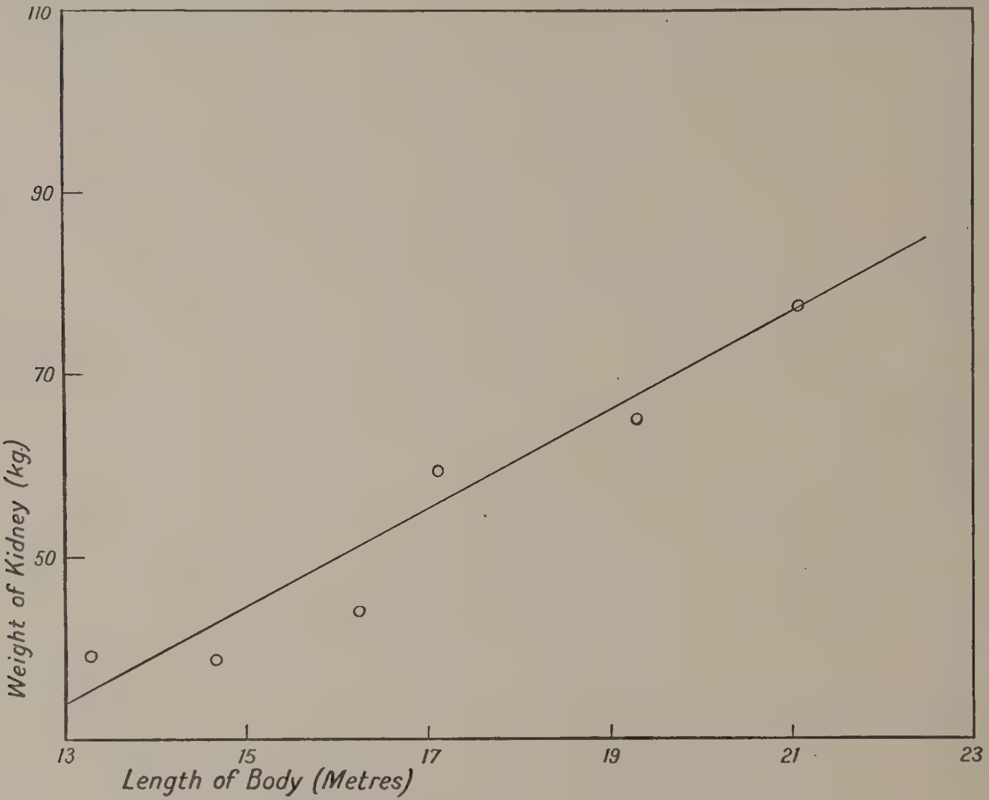

Fig. 37. Young Fin whales. Length of body and weight of kidney.

Length of whale (m.)	Weight of kidney (kg.)
13·0	33·5
14·0	38·75
15·0	44·0
16·0	49·75
17·0	55·0
18·0	60·25
19·0	65·75
20·0	71·25
21·0	76·75
22·0	82·25
23·0	88·0

The weights of these kidneys have been plotted against the length of the whales (Fig. 37). They are extremely scattered in position, but probably lie on some such straight line as that which has been drawn through them. The one female whale has been included in the figure.

From the figure the weights of the kidneys of whales of a series of body lengths can be estimated and are given on p. 452.

The left kidney only of thirty-five female Fin foetuses and thirty-five male Fin foetuses were also weighed. In Table VI are shown the average weights of the kidneys for foetuses of body lengths differing by 1·0 m. The weights of some of the foetuses are also given.

The weights of the foetuses were taken also with the spring balance. Foetuses too large to be lifted whole had to be cut into two or more sections with much resulting loss of blood. The larger the foetus, therefore, the less accurate the weighing.

VOLUME OF THE KIDNEY

The volume of the kidney was obtained as follows:

Blocks of kidney substance of a convenient size were weighed and from the average weight of a large number of such blocks, cut as uniformly as possible, the volume of those kidneys whose weight is already known can be calculated.

The size of the blocks of kidney substance used, was as nearly as possible, 20 × 20 × 5 cm. The average of 221 weighings of such blocks gave the weight of this mass of kidney substance as 1·82 kg. From this the volume of the kidneys whose weight is already known can easily be calculated and is shown in Table V.

With the small number of figures obtained it is not possible to make distinctions between the sexes either in the case of the weights or the volumes of the kidneys, but from the data already obtained for the linear dimensions of the kidney there is no reason to suppose that any sexual difference exists.

The following are the kidney volumes calculated from the weights derived from Fig. 37:

Length of body (m.)	Volume of kidney (c.cm.)
13·0	36,000
14·0	42,500
15·0	48,500
16·0	54,500
17·0	60,500
18·0	66,500
19·0	72,500
20·0	78,500
21·0	84,500
22·0	90,000
23·0	96,000

In the above estimations of the weight and volume of the kidney only Fin whales were dealt with, since no Blue whale foetal kidneys were weighed and insufficient foetuses were examined.

DENSITY OF THE KIDNEY

From the actual weight of the kidneys and from their calculated volumes it may be estimated that the density of the organ is 0·910. This is probably not far from correct since the kidney just floats in water.

DIAMETER OF THE RENCULI

The average diamter of the renculi of the kidney was measured in a great number of Fin whales of both sexes and some Blue whales.

Slices of the kidney substance were cut thick enough to avoid any danger of cutting two sections through the same renculus, and the diameter in cm. was measured of up to forty renculi cut as nearly as possible through the centre of the papilla. Again, in order to avoid any danger of measuring the same renculus twice, only the renculi on one surface of each slice of kidney substance were measured. The average of these counts was taken as the average diameter of the renculi of the kidney.

The following numbers of such counts were made on the kidneys:

		Number of counts				Total
		15	20	30	40	
Fin whales:	Males	33	—	5	188	226
	Females	32	2	9	160	203
Blue whales:	Males	10	—	2	20	32
	Females	12	—	2	24	38

Great variability, similar to that which characterizes the dimensions of the kidney itself, was found in the diameter of the renculi, and there is no correlation between the size of the renculi and the length of the body. The size of the kidney is the controlling factor in the growth of its component renculi as, indeed, might be expected. The average diameter of the renculi for kidneys represented by a series of kidney numbers is shown in Tables VII A (Fin whales) and VII B (Blue whales). The numbers in question differ by five units and the kidney dimensions (length, breadth and depth) to which these numbers correspond are also shown in the table. (The dimensions represent the average size of the kidney for each range of kidney numbers.) The range of body length to which these kidney sizes and numbers correspond is shown in column 3 of each table.

Again there is no sex difference between the diameters of the renculi in either Blue or Fin whales, neither does there appear to be any difference in the rencular diameter in kidneys of the same size in the two separate species.

Fig. 38 represents the curve which results when the rencular diameters (Fin whales only) are plotted against the kidney numbers. It will be noticed that there is a considerable drop in the curve opposite kidney numbers from 30 to 40. This seems to be due, not to the fact that the larger kidneys have smaller renculi, but that the largest kidney numbers do not represent the true size of the kidney, for the reason already stated, namely, that an excessive depth but a small length or breadth will produce an unduly large kidney number. The part of the curve, therefore, corresponding to kidney numbers between 30 and 40 has been dotted in Fig. 38.

The figure demonstrates clearly the absence of any sex difference in the diameters of the renculi.

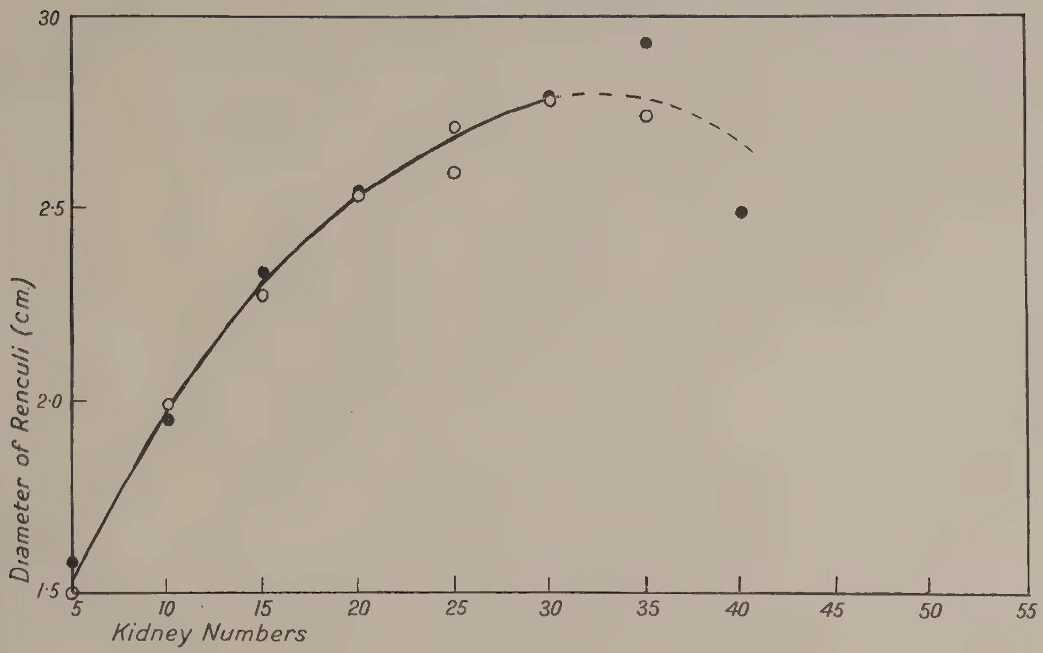

Fig. 38. Adult Fin whales. Kidney numbers and diameters of renculi.

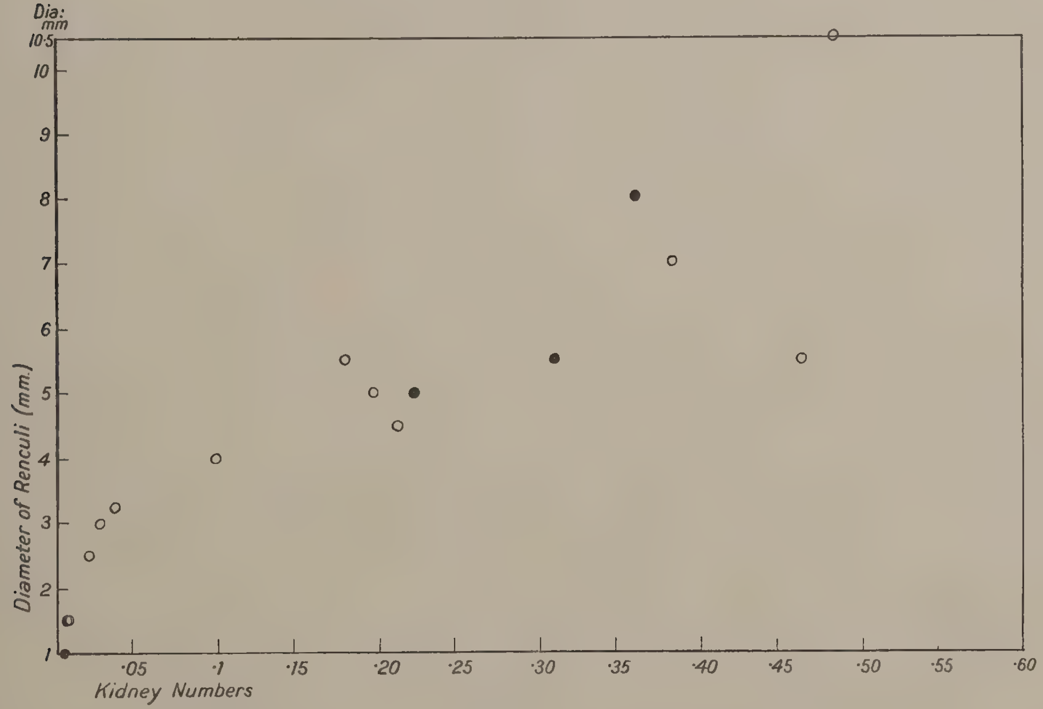

Fig. 39. Foetal Fin whales. Kidney numbers and diameters of renculi.

Even discounting this upper part of the line its shape is still that of a gentle curve. In other words, the diameter of the renculi does not increase evenly with the size of the kidney in the adult, but begins to lag behind the growth of the organ when the kidney reaches a size represented by the numbers 20 and 25. This kidney size corresponds to a body length of 21·0 m. for male whales and 21·0–22·0 m. for females. This is about the length at which the growth of the body ceases. It may perhaps be assumed that the shape of the curve is due to the fact that when the body has begun to slow down in growth, the renculi begin, one by one according to their individual conditions of growth, to cease to grow also, but that they do not all cease increasing in diameter at the same time and also still continue to grow apart, so that increase in the size of the whole organ continues to take place, but increase in the average diameter of the renculi falls off.

In Table VIII the rencular diameters are shown for foetal Fin whales of body lengths from about 1·0 to about 4·0 m. and in Fig. 39 these diameters are shown plotted against the foetal kidney numbers. Each figure shown in the table represents one count of ten renculi performed upon one kidney and is not representative of a large number of separate counts as are the same figures for the adult. For this reason the points in the upper part of the figure become more and more scattered as the individual renculi begin to show more and more variations in size. The shape of the curve, however, is evident. The renculi increase rapidly in diameter with the increase of the kidney up to sizes represented by the number 0·05. This corresponds to body lengths in the region of 2·0 m. This is the stage at which the renculi become differentiated from the lobules. After this point the line straightens out and the increase in diameter of the renculi may be said to be directly proportional to the size of the kidneys. The foetal and adult graphs may be assumed to be continuous so that this relation between the renculi and the dimensions of the kidney holds throughout the growing period of the whale until growth begins to slow down, when increase in diameter of the renculi ceases gradually before that of the kidney itself.

NUMBER OF RENCULI IN THE KIDNEY

One estimation only was made of the numbers of renculi in the kidney. The method used is a rough one and was applied to the kidney of the one female Fin whale whose kidney was weighed. The weight of the kidney was 65·5 kg.

The number of renculi counted in a given area (20 × 20 cm.) was between 80 and 85.

The weight of a given block of the kidney substance measuring 20 × 20 × 5 cm. was 1·82 kg.

The average diameter of the renculi (a count of 40) was 2·4 cm.

The number of renculi in the block was therefore:

$$(80 \text{ or } 85) \times \frac{5{\cdot}0}{2{\cdot}4}.$$

The above gives the number counted in the given area multiplied by about two, since the block of kidney was about twice (5/2·4) the rencular diameter in depth.

The total number of renculi in the whole mass of the kidney will thus be given roughly by:

$$\frac{(80 \text{ or } 85) \times 5}{2{\cdot}4} \times \frac{\text{Total weight of the kidney}}{\text{Weight of the block}},$$

$$\text{i.e.} \quad \frac{(80 \text{ or } 85) \times 5}{2{\cdot}4} \times \frac{65{\cdot}5}{1{\cdot}82},$$

i.e. 5998 or 6372.

The true number will lie somewhere between these two figures. The block of kidney substance was cut at random from the mass of a lobe of the organ, so that it may be said that the calculation takes account of the space in the kidney occupied by connective tissue and blood vessels.

Estimations and counts by other authors all gave smaller numbers than this. Beauregard and Boulart estimated the number to be 3000 and Daudt a little less. Hyrtl's count of 156 only includes renculi at the three surfaces of a foetal Piked whale (*B. rostrata*). Schulte found 1350 in a foetal Sei whale (*B. borealis*), Watson and Young 400 in *Delphinapterus*, Anthony 459 and 474 for *Delphinus delphis* and *Mesoplodon* respectively.

TABLE I

Adult Fin whales

Measurements of kidney (in cm.) (left kidney only)

Total body length (m.)	Females					Males				
	No. of measurements	Length	Breadth	Depth	Kidney no.	No. of measurements	Length	Breadth	Depth	Kidney no.
12·0	—	—	—	—	—	—	—	—	—	—
13·0	—	—	—	—	—	1	(124)	50	17	—
14·0	1	100	32	17	5·5	2	91	43	20	7·8
15·0	—	—	—	—	—	4	108	40·5	17	7·4
16·0	3	120	41	19	10·9	3	135	46	22	13·7
17·0	3	122	47	21	12·04	10	142	49	18	12·5
18·0	14	141	53	22	16·4	20	151	51	22	16·9
19·0	14	152	55	20	16·7	28	162	55	20	17·8
20·0	23	163	58	21	19·8	66	171	58	20	19·8
21·0	33	182	59	21	22·5	51	175	57	20	19·9
22·0	50	185	64	21	24·9	8	204	66	19	25·6
23·0	17	191	69	20	27·7	—	—	—	—	—
24·0	1	195	55	25	26·8	—	—	—	—	—

TABLE I A

Adult Fin whales

Ratios of length to breadth and depth, and of length to breadth, in kidney measurements (left kidney only)

Total body length (m.)	Females					Males				
	Ratio			Ratio		Ratio			Ratio	
	Length	Breadth	Depth	Length	Breadth	Length	Breadth	Depth	Length	Breadth
13·0	—	—	—	—	—	7·3	2·9	1	2·5	1
14·0	5·9	1·9	1	3·1	1	4·55	2·15	1	2·15	1
15·0	—	—	—	—	—	6·3	2·4	1	2·7	1
16·0	7·4	2·2	1	3·4	1	6·14	2·1	1	2·9	1
17·0	5·8	2·2	1	2·6	1	7·9	2·7	1	2·9	1
18·0	6·7	2·4	1	2·7	1	6·6	2·3	1	3·0	1
19·0	7·6	2·75	1	2·8	1	8·1	2·75	1	2·9	1
20·0	7·75	2·76	1	2·8	1	8·55	2·9	1	2·9	1
21·0	8·7	2·8	1	3·1	1	8·75	2·85	1	3·07	1
22·0	8·8	3·05	1	2·9	1	10·74	3·47	1	3·09	1
23·0	9·5	3·45	1	2·8	1	—	—	1	—	1
24·0	7·7	2·2	1	3·5	1	—	—	1	—	1
Av.	7·6	2·6	1	3·0	1	7·5	2·6	1	2·8	1

For explanation of the term "kidney number" see p. 449.

TABLE II

Adult Blue whales

Measurements of kidney (in cm.) (left kidney only)

Total body length (m.)	Females					Males				
	No. of measurements	Length	Breadth	Depth	Kidney no.	No of measurements	Length	Breadth	Depth	Kidney no.
17·0	—	—	—	—	—	1	133	40	17	9·0
18·0	2	109	39	16	6·8	—	—	—	—	—
19·0	2	151	54	23	17·4	2	133	44	21	12·3
20·0	4	145	52	22	16·6	1	195	60	23	26·9
21·0	5	166	57	20	18·9	5	165·5	57	20	18·9
22·0	1	206	68	25	35·0	3	186	54	29	29·1
23·0	1	188	80	29	43·6	3	191	52	23	22·8
24·0	1	199	66	28	36·7	—	—	—	—	—
25·0	4	207	72	27	40·2	—	—	—	—	—
26·0	4	205	72	23	33·9	—	—	—	—	—
27·0	1	228	81	24	44·4	—	—	—	—	—
28·0	1	210	70	27	39·7	—	—	—	—	—

TABLE II A

Adult Blue whales

Ratios of length to breadth and depth, and of length to breadth, in kidney measurements (left kidney only)

Total body length (m.)	Females					Males				
	Ratio			Ratio		Ratio			Ratio	
	Length	Breadth	Depth	Length	Breadth	Length	Breadth	Depth	Length	Breadth
17·0	—	—	—	—	—	7·8	2·35	1	3·3	1
18·0	6·8	2·4	1	2·5	1	—	—	—	—	—
19·0	6·6	2·2	1	3·0	1	6·3	2·1	1	3·02	1
20·0	6·6	2·4	1	2·8	1	8·4	2·6	1	3·25	1
21·0	8·3	2·85	1	2·9	1	8·27	2·8	1	2·9	1
22·0	8·0	2·7	1	3·0	1	6·4	1·9	1	3·4	1
23·0	6·5	2·76	1	2·3	1	8·3	2·3	1	3·7	1
24·0	7·1	2·4	1	3·0	1	—	—	—	—	—
25·0	8·0	2·8	1	2·9	1	—	—	—	—	—
26·0	8·9	3·1	1	2·8	1	—	—	—	—	—
27·0	9·5	3·4	1	2·8	1	—	—	—	—	—
28·0	7·8	2·6	1	3·0	1	—	—	—	—	—
Av.	7·6	2·7	1	2·8	1	7·6	2·3	1	3·3	1

TABLE III

Foetal Fin whales

External measurements of kidney (in cm.)

Sex	Length of foetus (m.)	Right kidney				Left kidney			
		Length	Breadth	Depth	Kidney no.	Length	Breadth	Depth	Kidney no.
FEMALES	0·8	7·2	3·0	1·3	0·0028	6·3	3·5	1·2	0·0026
	1·0	11·5	4·5	1·5	0·008	11·5	4·0	1·25	0·0057
	1·26	14·5	5·5	2·75	0·022	14·5	5·0	3·25	0·023
	1·40	14·5	6·0	3·0	0·026	14·75	5·75	2·5	0·019
	1·79	20·0	8·0	3·5	0·056	20·5	7·5	3·5	0·054
	2·03	25·0	8·25	4·0	0·082	24·5	8·5	4·5	0·093
	2·64	30·0	13·0	6·0	0·23	31·0	13·0	5·5	0·22
	3·2	35·5	15·0	9·0	0·48	32·0	12·0	8·0	0·31
MALES	0·31	3·3	1·4	0·9	0·0004	—	—	—	—
	0·6	6·0	2·25	1·0	0·0013	5·25	2·2	1·1	0·0013
	0·71	8·5	3·25	1·0	0·0027	8·0	3·25	1·2	0·0031
	1·0	12·0	4·75	1·25	0·0071	—	—	—	—
	1·23	14·5	5·75	2·0	0·017	14·0	5·0	2·0	0·014
	1·47	18·5	6·5	2·5	0·027	16·5	7·0	2·75	0·032
	1·7	21·5	7·5	3·25	0·052	19·5	9·0	3·75	0·066
	2·03	25·5	9·5	3·5	0·085	23·0	9·5	4·5	0·096
	2·3	25·25	10·0	3·5	0·088	23·5	9·5	4·5	0·10
	2·48	31·0	11·5	6·0	0·21	29·0	12·0	5·5	0·17
	2·77	29·5	11·0	6·0	0·19	27·0	13·0	6·0	0·21
	3·0	34·0	11·0	6·25	0·21	32·0	15·0	5·0	0·24
	3·2	36·0	15·0	9·5	0·51	35·5	14·5	9·0	0·46
	3·62	41·0	17·5	8·5	0·69	43·0	16·5	8·5	0·60
	3·8	40·0	15·5	9·0	0·56	39·0	16·5	7·5	0·64
	4·97	—	—	—	—	51·0	22·0	10·0	1·1

Table III a

Foetal Fin whales

Ratios of length to breadth and depth, and of length to breadth, in kidney measurements

Sex	Length of foetus (m.)	Right kidney					Left kidney				
		Ratio			Ratio		Ratio			Ratio	
		Length	Breadth	Depth	Length	Breadth	Length	Breadth	Depth	Length	Breadth
FEMALES	0·8	5·54	2·3	1	2·4	1	5·25	2·9	1	1·8	1
	1·0	7·67	3·0	1	2·55	1	9·2	3·2	1	2·87	1
	1·26	5·27	2·0	1	2·64	1	4·52	1·54	1	2·96	1
	1·40	4·83	2·0	1	2·41	1	5·9	2·3	1	2·56	1
	1·79	5·71	2·28	1	2·5	1	5·86	2·14	1	2·73	1
	2·03	6·25	2·06	1	3·03	1	5·44	1·67	1	2·88	1
	2·64	5·0	2·16	1	2·3	1	5·64	2·18	1	2·38	1
	3·20	3·94	1·66	1	2·37	1	4·00	1·5	1	2·66	1
	Av.	5·54	2·13	1	2·54	1	5·72	2·18	1	2·60	1
MALES	0·31	3·67	1·55	1	2·36	1	—	—	—	—	—
	0·6	6·0	2·25	1	2·67	1	4·77	2·0	1	2·39	1
	0·71	8·5	3·25	1	2·61	1	6·7	2·7	1	2·15	1
	1·0	9·52	3·8	1	2·52	1	—	—	—	—	—
	1·23	7·25	2·87	1	2·52	1	7·0	2·5	1	2·8	1
	1·47	7·4	2·60	1	2·84	1	6·0	2·54	1	2·36	1
	1·7	6·61	2·3	1	2·87	1	5·22	2·4	1	2·17	1
	2·03	7·29	2·71	1	2·58	1	5·1	2·1	1	2·31	1
	2·3	7·2	2·86	1	2·52	1	5·22	2·1	1	2·47	1
	2·48	5·16	1·91	1	2·69	1	5·27	2·18	1	2·41	1
	2·77	4·9	1·83	1	2·68	1	4·5	2·16	1	2·77	1
	3·0	5·6	1·78	1	3·09	1	6·4	3·0	1	2·13	1
	3·2	3·79	1·58	1	2·40	1	3·94	1·6	1	2·47	1
	3·62	4·82	2·06	1	2·34	1	5·06	1·94	1	2·34	1
	3·8	4·4	1·72	1	2·58	1	5·2	2·2	1	2·36	1
	4·97	—	—	—	—	—	5·1	2·2	1	2·31	1
	Av.	6·2	2·34	1	2·62	1	5·38	2·25	1	2·38	1

TABLE IV

Foetal Blue whales

External measurements of kidney (in cm.)

Sex	Length of foetus (m.)	Right kidney			Left kidney		
		Length	Breadth	Depth	Length	Breadth	Depth
Females	0·84	—	—	—	10·0	3·75	2·0
	1·0	11·25	4·75	1·75	10·0	4·9	2·0
	1·3	13·2	5·4	2·4	11·2	5·6	2·4
	1·42	16·0	6·3	2·6	—	—	—
	1·63	15·0	7·0	2·5	—	—	—
	2·52	28·0	11·75	5·0	—	—	—
Males	0·8	—	—	—	7·0	3·0	1·0
	0·98	—	—	—	10·5	3·5	1·5

TABLE IV A

Foetal Blue whales

Ratios of length to breadth and depth, and of length to breadth, in kidney measurements

Sex	Length of foetus (m.)	Right kidney					Left kidney				
		Ratio			Ratio		Ratio			Ratio	
		Length	Breadth	Depth	Length	Breadth	Length	Breadth	Depth	Length	Depth
FEMALES	0·84	—	—	—	—	—	5·0	1·87	1	2·7	1
	1·0	6·4	2·7	1	2·37	1	5·0	2·45	1	2·04	1
	1·3	5·5	2·25	1	2·4	1	4·7	2·3	1	2·0	1
	1·42	6·15	2·4	1	2·5	1	—	—	—	—	—
	1·63	6·0	2·8	1	2·1	1	—	—	—	—	—
	2·52	5·6	2·35	1	2·4	1	—	—	—	—	—
	Av.	5·93	2·51	1	2·35	1	4·9	2·2	1	2·25	1
MALES	0·8	—	—	—	—	—	7·0	3·0	1	2·3	1
	0·98	—	—	—	—	—	7·0	2·3	1	3·0	1
	Av.	—	—	—	—	—	7·0	2·65	1	2·65	1

TABLE V

Adult Fin whales

Weights and volumes of kidneys

The volumes are calculated from the known weight of a given volume of the kidney. The average weight (221 weighings) of a block of the kidney 20 × 20 × 5 cm. = 4 lbs. 1 oz. or 1·82 kg.

Sex	Body length (m.)	Kidney measurement (cm.)	Weight (kg.)	Volume (c.c.)
MALES	14·67	97 × 45 × 19	38·5	41,750
	13·3	124 × 50 × 17	39·5	43,407
	16·25	100 × 47 × 24	44·0	48,351
	17·1	135 × 52 × 20	59·5	65,386
	21·05	163 × 57 × 22	77·25	84,890
FEMALE	19·3	140 × 55 × 18	65·5	71,979

TABLE VI

Foetal Fin whales

Total weights of body and weights of kidney

Length of foetus (m.)	Females			Males		
	No. of weighings	Weight of foetus (kg.)	Weight of kidney (kg.)	No. of weighings	Weight of foetus (kg.)	Weight of kidney (kg.)
0·5	—	1·125	—	—	—	—
0·6	—	2·75	—	4	2·5	0·012
0·7	1	4·25	0·028	2	3·85	0·023
0·8	1	5·75	0·028	3	8·18	0·025
0·9	1	8·0	0·028	1	8·5	0·042
1·0	3	10·125	0·0501	3	11·0	0·062
1·1	4	13·06	0·074	1	12·5	0·07
1·2	2	18·25	0·0955	2	18·91	0·116
1·3	4	19·2	0·1315	1	23·5	0·12
1·4	2	27·25	0·1335	3	28·75	0·195
1·5	—	—	—	2	37·6	0·219
1·6	2	45·125	0·193	2	40·25	0·308
1·7	2	43·5	0·273	—	—	—
1·8	2	70·0	0·396	—	—	—
1·9	3	75·0	0·341	1	57·87	0·368
2·0	3	87·8	0·50	1	88·0	0·57
2·1	2	94·6	0·609	—	—	—
2·2	—	—	—	—	—	—
2·3	—	—	—	2	115·25	0·665
2·4	—	—	—	—	—	—
2·5	—	—	—	1	174·0	1·02
2·6	—	—	—	1	180·0	1·1
2·7	—	—	—	3	197·6	1·26
2·8	—	—	—	—	—	—
2·9	—	—	—	—	—	—
3·0	—	—	—	—	—	—
3·1	1	300·0	1·415	—	—	—
3·8	1	407·0	2·8	—	—	—

TABLE VII A

Adult Fin whales

Kidney size and diameter of renculi

Sex	Kidney nos. (Range of)	Kidney size represented (approx.) by kidney nos. (cm.)	Body length (Range covered by kidney sizes and nos.) (m.)	No. of kidneys examined	Average diameter of renculi (cm.)
MALES	1– 5	91 43 20	5–13	2	1·5
	5–10	108 40 18	14–15	7	1·99
	10–15	142 49 18	16–17	31	2·27
	15–20	175 57 20	18–21	65	2·53
	20–25	204 66 19	Over 21	51	2·59
	25–30	182 63 24	Over 21	18	2·78
	30–35	200 64 25	Over 21	3	2·74
FEMALES	1– 5	100 32 17	5–14	1	1·58
	5–10	140 41 19	15–16	7	1·95
	10–15	141 53 22	16–18	16	2·33
	15–20	163 58 21	18–20	44	2·54
	20–25	185 64 21	21–22	39	2·71
	25–30	195 55 25	23–24	34	2·79
	30–35	194 74 24	23–24	15	2·93
	35–40	194 55 25	Over 24	2	2·49

TABLE VII B

Adult Blue whales

Kidney size and diameter of renculi

Sex	Kidney nos. (Range of)	Kidney size represented (approx.) by kidney nos. (cm.)	Body length (Range covered by kidney sizes and nos.) (m.)	No. of kidneys examined	Average diameter of renculi (cm.)
MALES	5–10	133 43 17	18–19	2	1·99
	10–15	—	—	—	—
	15–20	169 60 19	20–21	2	2·23
	20–25	185 65 20	21–22	2	2·25
	25–30	195 60 23	(20·4)	1	2·4
	30–35	195 65 25	23	1	2·97
	35–40	201 75 24	25·5	1	3·53
	40–45	227 74 27	(22·5)	1	2·65
	45–50	—	—	—	—
FEMALES	5–10	139 39 16	17–18	2	2·35
	10–15	143 50 19	18–19	2	2·36
	15–20	158 54 23	19–21	4	2·35
	20–25	205 55 22	20–22	2	2·75
	25–30	203 60 22	22–25	2	2·84
	30–35	196 75 25	Over 25	2	3·27
	35–40	210 70 27	(27·5)	1	3·9
	40–45	217 81 25	Over 25	3	2·87
	45–50	204 83 29	Over 25	2	3·44

TABLE VIII

Foetal Fin whales

Kidney size and diameter of renculi

Sex	Kidney no.	Kidney size (cm.)	Length of body (m.)	Approximate diameter of renculi (mm.)
MALES	0·0067	9·25 3·6 2·0	0·98	1·0– 2·0
	0·035	15·6 6·5 3·5	1·42	3·0– 3·5
	0·0976	26·5 10·5 4·5	2·15	4·0
	0·178	29·75 12·0 5·0	3·07	5·0– 6·0
	0·195	29·5 11·0 6·0	2·77	5·0
	0·21	29·0 12·0 5·5	2·48	4·0– 5·0
	0·36	35·5 15·5 6·5	3·0	8·0
	0·46	35·5 14·5 9·0	3·2	5·0– 6·0
	0·48	39·0 16·5 7·5	3·8	10·0–11·0
	0·60	43·0 16·5 8·5	3·62	9·0–12·0
FEMALES	0·0063	12·0 5·4 3·0	1·0	1·0– 2·0
	0·019	14·5 6·0 3·0	1·2	2·0– 3·0
	0·027	16·75 6·5 2·5	1·66	3·0
	0·053	19·0 7·0 4·0	1·9	3·0
	0·220	31·0 13·0 5·5	2·64	5·0
	0·210	26·0 12·5 6·5	3·0	9·0

PLATE II

Fig. 1. Fully extruded penis of a Fin whale 20·0 m. in length. The genital slit (penis sac) and accessory genital grooves are seen. The terminal cone occupies about the distal half of the organ. In the stretched condition of the penis the praeputial fold is not well seen.

Length of penis	1·96 m.
Length of terminal cone	0·90 m.
Distance from centre of anus to centre of base of penis	1·54 m.

Fig. 2. External genitalia of a female Fin whale 22·62 m. in length. This shows the usual undistended condition of the parts.

Distance from centre of anus to centre of vulva	0·64 m.
Distance between the nipples	0·35 m.

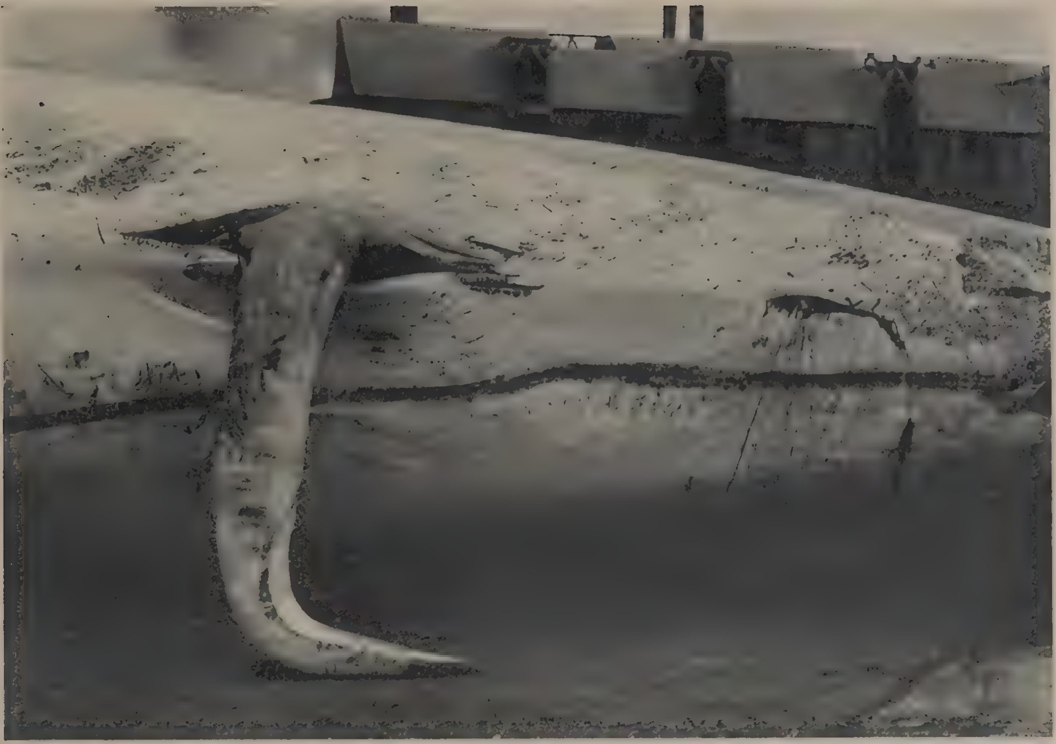

Fig. 1 *A. Saunders phot.*

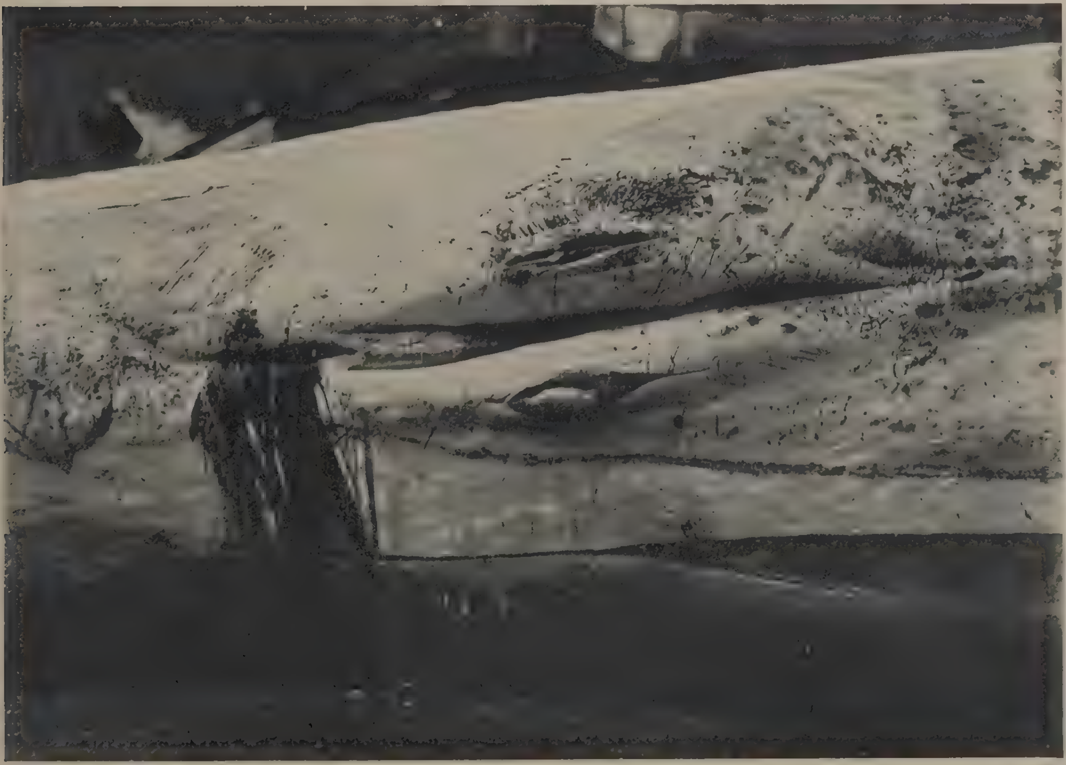

Fig. 2 *A. Saunders phot.*

EXTERNAL GENITALIA OF THE FIN WHALE

PLATE III

Fig. 1. Posterior ventral surface of the abdomen and tail of a female Fin whale 22·65 m. in length. The position and relations of the external genitalia and the accessory grooves is shown.

Distance from centre of anus to centre of vulva	0·65 m.
Distance between the nipples	0·51 m.

Fig. 2. External genitalia of above. This whale was lactating and the vulva is distended as in "heat". *a*, Clitoris. *b*, Labia majora. *c*, Labia minora. *d*, Genital aperture. *e*, Urinary aperture. *f*, Corrugated fleshy pad between the genital and urinary apertures.

Fig. 3. Vulva of a foetal Fin whale. The labia majora are held apart by means of a metal strip which has been passed under the vaginal band. The genital opening lies immediately beneath the vaginal band and is partly concealed by the metal strip. *a*, Praeputium of the clitoris. *b*, Clitoris. *c*, Labia minora. *d*, Labia majora. *e*, Vaginal band. *f*, Mammary groove. *g*, Urinary aperture.

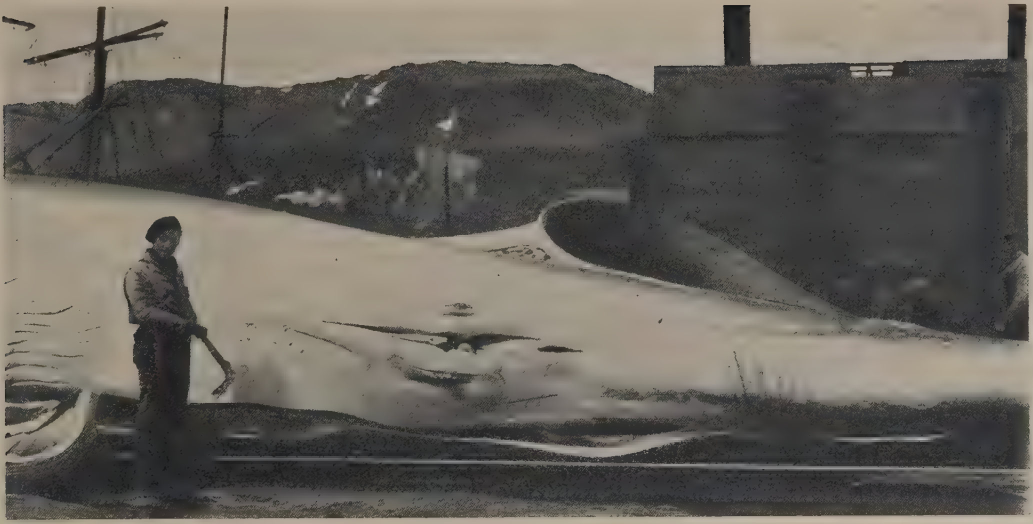

Fig. 1 *A. Saunders phot.*

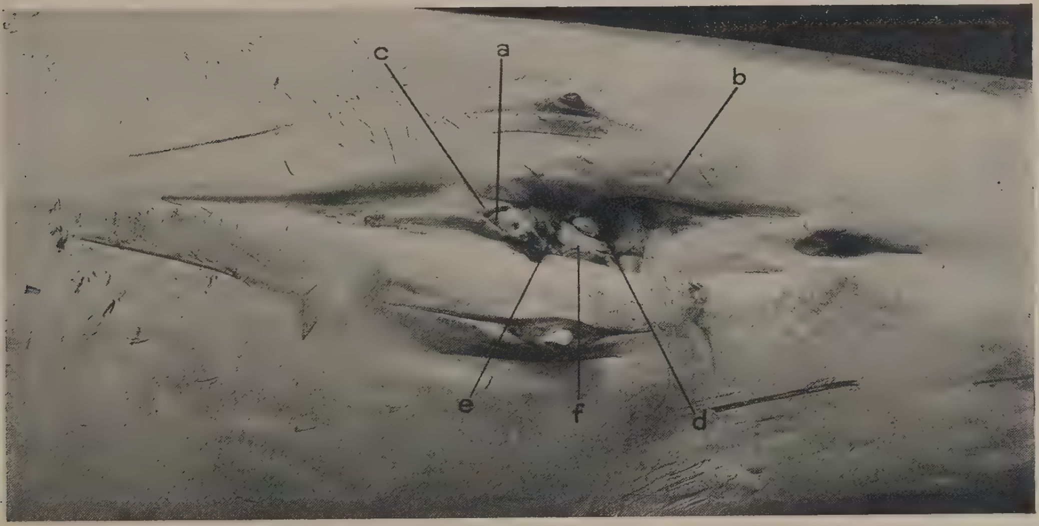

Fig. 2 *A. Saunders phot.*

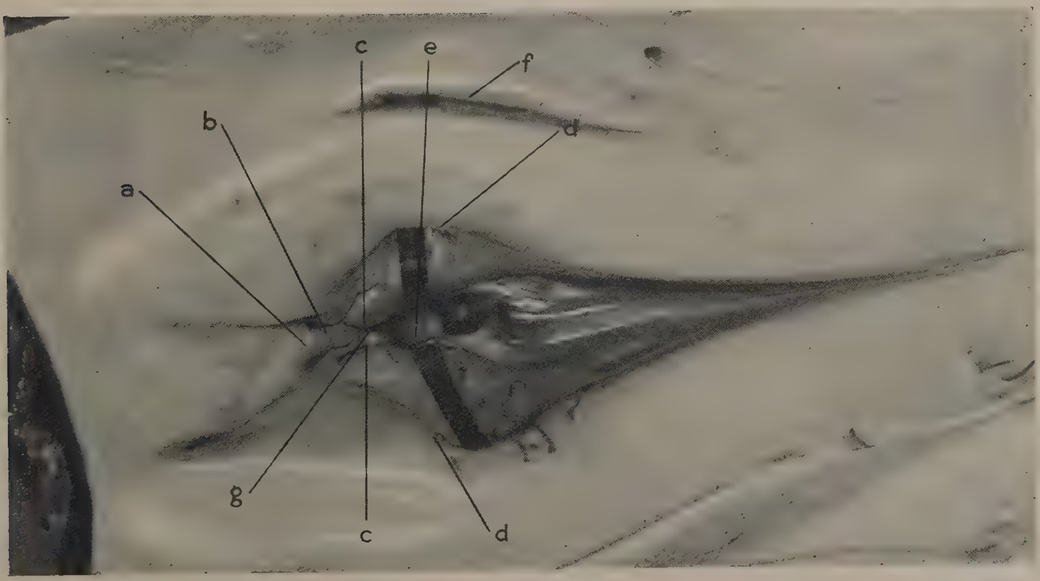

Fig. 3 *A. Saunders phot.*

EXTERNAL GENITALIA OF THE FIN WHALE

[*Discovery Reports*, *Vol. V*, *pp.* 467–484, *Plate IV*, *text-fig.* 1, *November*, 1932.]

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LOBSTER-KRILL

ANOMURAN CRUSTACEA THAT ARE THE FOOD OF WHALES

By

L. HARRISON MATTHEWS, M.A.

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LOBSTER-KRILL
ANOMURAN CRUSTACEA THAT ARE THE FOOD OF WHALES

By L. Harrison Matthews, M.A.

(Plate IV; text-fig. 1)

Two species of the genus *Munida*, *M. subrugosa* (White) and *M. gregaria* (Fabricius), are closely allied and very similar in general characters. They are often found together in the same localities, and occur in both the South Atlantic and Pacific Oceans. They are of particular interest to the Discovery investigations as *M. gregaria*, probably with a third allied species, *Pleuroncodes planipes* (Stimpson) from the Pacific coast of Mexico, form an important food of some species of whale.

M. gregaria has a pelagic post-larval stage which differs in appearance from the adult, while in *M. subrugosa* the corresponding stage is bottom-living and similar to the adult. Considerable confusion as to the relation of the pelagic post-larval stage of *M. gregaria* to the adult exists in the literature relating to the species. This post-larval stage was originally named as a separate species, *Grimothea gregaria*, and the name *Grimothea* is used in this paper as a convenient label for this stage of the species. The hybrid English-Norwegian term, "lobster-krill",[1] is adopted as more descriptive than the corresponding New Zealand name, "whale-feed", which in that country refers only to the *Grimothea* stage of *M. gregaria*.

MATERIAL EXAMINED

The Discovery collections contain a long series of both species and their post-larval stages.

St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Islands. Large otter trawl, 105–115 m.
- *M. subrugosa.* 19 specimens, 7 ♂, 12 ♀, 16·5–38·0 mm., 3 with Bopyrid parasites on the gills.
- *M. gregaria.* 45 specimens, 28 ♂, 17 ♀, 13·0–38·0 mm., 1 with Bopyrid parasite on gills.

Fine nets on trawl, 105–115 m.
- *M. subrugosa.* 12 specimens, 5 ♂, 7 ♀, 12·0–20·0 mm.; 81 specimens, post-larval, 3·5–8·5 mm.
- *M. gregaria.* 39 specimens, post-larval (*Grimothea*), 8·0–12·0 mm.

St. 67. 23. v. 26. 47° 18′ 00″ S, 51° 52′ 00″ W. 4000 m. 1-metre horizontal tow-net, 90 (–0) m.
- *M. gregaria.* 27 specimens, post-larval (*Grimothea*), 9·0–11·0 mm.

St. 223. 27. iv. 27. St Francis' Bay, Cape Horn. 55° 51′ 15″ S, 67° 29′ 30″ W. Rectangular bottom net, 63 m.
- *M. subrugosa.* 35 specimens, 21 ♂, 13 ♀, 20·0–35·0 mm.
- *M. gregaria.* 60 specimens, 30 ♂, 30 ♀, 20·0–34·0 mm.

St. WS 100. 23. iv. 27. 50° 53′ 00″ S, 61° 26′ 00″ W. 132 m. 1-metre horizontal tow-net, 61 m.
- *M. gregaria.* 276 specimens, post-larval (*Grimothea*), 7·5–9·0 mm.

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[1] "Krill" is a Norwegian word meaning "whale-food".

St. WS 576. 17. iv. 31. Berkeley Sound, East Falkland Islands. 51° 35′ 00″ S, 57° 49′ 45″ W. Large otter trawl, 34–24 m.
M. subrugosa. 4 specimens, all ♀, 29·0–34·0 mm.
M. gregaria. 20 specimens, 10 ♂, 10 ♀, 28·0–37·0 mm.

S.S. 'Ernesto Tornquist.' Gulf of St George, Patagonia. 45°–47° S, 66°–68° W. All *M. gregaria.*
23. iii. 29. Surface. 13 specimens, 4 ♂, 9 ♀, 21·0–31·0 mm.
27. iii. 29. Surface. 15 specimens, 5 ♂, 9 ♀, 1 damaged, 18·0–29·0 mm.
29. iii. 29. Surface. 20 specimens, 8 ♂, 12 ♀, 20·0–28·0 mm.
2. iv. 29. Surface. 18 specimens, 7 ♂, 11 ♀, 20·0–32·0 mm.
5. iv. 29. Surface. 21 specimens, 6 ♂, 14 ♀, 1 damaged, 20·0–33·0 mm.
6. iv. 29. Surface. 14 specimens, 6 ♂, 8 ♀, 19·0–31·0 mm.

The measurements of the specimens refer to the length of the carapace from its posterior border to the tip of the rostrum.

DISTRIBUTION

Both *Munida subrugosa* and *M. gregaria* are restricted to the southern hemisphere, and their distribution, so far as our present knowledge goes, appears to be sharply discontinuous. They have been found in abundance in the waters of New Zealand and its sub-Antarctic islands, and in Bass Strait. In the South Atlantic they occur in plenty at the Falkland Islands, Tierra del Fuego, the Magellan Straits and Patagonia. *M. gregaria* has been recorded from the west coast of South America as far north as latitude 41° 30′ S and on the east coast as far north as latitude 51° S. The corresponding latitudes for *M. subrugosa* are 50° S on the west coast and 35° S on the east coast.

The two species evidently inhabit comparatively warm water. They are found near the Falklands and at Cape Horn, where surface temperatures vary between 5·5° and 9·0° C., but are entirely absent from the much colder waters of the South Shetlands, South Georgia and Bouvet Island. At Tristan da Cunha and Gough Island, where temperatures are higher than at the Falklands, neither species has been found, and there are no records from the Kerguelen area.

The vertical distribution of *M. subrugosa* extends from the shore to a recorded depth of 600 fathoms (Henderson, 1888), and of *M. gregaria* from the shore to a recorded depth of 60 fathoms (Young, 1925).

SWARMING

Both *M. subrugosa* and *M. gregaria* frequently occur in enormous shoals, the adults usually on the bottom, while the *Grimothea* stage of *M. gregaria* has been on occasion so plentiful at the surface as to colour the sea bright red over large areas. The adult *M. gregaria* is also sometimes found in swarms at the surface.

At St. 51 (4. v. 26, off Eddystone Rock, East Falkland Islands) the *Grimothea* stage of *M. gregaria* was found to be swarming at the surface, and at the same time large numbers of the adults of *M. gregaria* and adults and young of *M. subrugosa* were taken in the trawl on the bottom at a depth of 105–115 m. So great was the catch of these Crustacea that after preserving a long series of specimens the remainder was sent to the cook and was much appreciated in the wardroom and on the mess-deck. At St. 223

(27. iv. 27, St Francis' Bay, Cape Horn) 95 adults of both species were taken on the bottom at 63 m. in a haul of only 7 min. duration. Similarly at St. WS 576 (17. iv. 31, Berkeley Sound, East Falkland Islands) numbers of adults of both species were taken on the bottom at a depth of 34–24 m. Thomson (1898, p. 194) has recorded of the adult *M. subrugosa* that in New Zealand "occasionally it comes up Otago Harbour in countless swarms, creeping up to the steps of the jetties and on to the submerged stones of the piers. It always appears to keep near the bottom and is rather slow and sluggish in its movements till pursued, when it jerks itself rapidly backwards".

There are many records of swarms of the *Grimothea* stage of *M. gregaria* being seen at the surface in South American seas. Some of the earlier records are quoted below (p. 479). From New Zealand waters Young (1925, p. 318) records, "*Munida gregaria* in its swimming stage visits Otago Harbour in large numbers during the warmer months of the year. The shoals are so large that the water appears to be quite red with the thousands of individuals which are clustered together. The smaller shoals often take a circular shape like a swarm of bees, and the incessant motion of each individual tends to heighten this illusion". The occurrence of swarms in other parts of the New Zealand seas is noted below (pp. 481–482) in discussing the relations of other animals to these Crustacea. On the other hand, that the swarms of the *Grimothea* stage are not always found at the surface is shown by the specimens in the Discovery collections from 105–115 m. (St. 51) and 61 m. (St. WS 100). It is of interest to note in this connection that Cheever (1850, p. 48),[1] speaking of the food of the Southern Right Whale, states, "the living of this vast animal is thought to be upon a substance which I hear universally called by whalemen 'right whale feed'. It appears in the water as a red-coloured insect. ...It is, in fact, a little red shrimp, sometimes seen floating on the surface of these seas alive, oftener dead, when it has the appearance at a distance of patches or clots of blood, only yellower....This 'feed' is supposed to lie generally rather deep under water in these southern seas, as whales are often taken in greatest numbers where none of it is to be seen on the surface".

Information and specimens kindly supplied by Captain S. Fagerli of the S.S. 'Ernesto Tornquist' show that the adult *M. gregaria* also swarms at the surface of the sea at times on the Patagonian coast. Captain Fagerli was whaling off the coast of Patagonia in the seasons 1927–8 and 1928–9, and states that enormous shoals of adult *M. gregaria* were observed at the surface of the sea all the way down the Patagonian coast from Bustamente Bay in the Gulf of St George to south of Santa Cruz (latitude 45° to 50° S). After high water with the wind on shore great numbers were seen washed up on the beaches. Shoals of the *Grimothea* stage were also seen; the swarms of adults and of the *Grimothea* stage were observed from the shore out as far as 70 fathoms of water. Captain Fagerli has presented to the Discovery collections specimens from Bustamente Bay, caught at the surface in a small net alongside his ship as she lay at anchor. All the specimens, 101 in number, are adult *M. gregaria*, and were taken between March 23 and April 6, 1929.

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[1] Cheever, Rev. H. T., *The Whaleman's Adventures in the Southern Ocean.* Ed. by the Rev. W. Scoresby. London, 1850.

In 1926 Captain Fagerli was whaling in Magdalena Bay on the Pacific coast of Mexico, and here also he observed at the surface shoals of adult *Munida* that appeared to be identical with those seen off Patagonia. Here also, after an on-shore wind, the beach at high-water mark was found covered with *Munida* to a depth of several inches. As Captain Fagerli had no specimens from Mexico an enquiry was sent to Dr Waldo L. Schmitt of the Smithsonian Institution, and his reply to Dr Kemp states that the U.S. National Museum has no specimens of *M. gregaria* from the west coast of America in its collections. He states: "I am without information on the score of pelagic swarms of post-larval *Munidas*. There is, however, a common pelagic form on the west coast of Mexico which is considered a good species and genus, *Pleuroncodes planipes*, Stimpson. Its abundance has been commented upon from time to time. In our *Mexico and Central America Coast Pilot* (*West Coast*), Hydrographic Office (Publ.) No. 84, sixth edit., p. 79, under Magdalena Bay, 'Phenomenon', appears the following:

"'A remarkable phenomenon, said to occur frequently in the bay, is the appearance of vast numbers of crustacea, resembling the shrimp, but not edible. They are from 1 to 2 inches long, giving the water a crimson color. The receding tide leaves the shore covered with thick layers, on which the sea birds feed, and the stench arising from their decomposition fills the air.'

"I first saw this or a similar note in an earlier edition when I was down there with the 'Albatross' in 1911, and though we got no specimens of them at that place, we have since received a number from Magdalena Bay from the late C. R. Orcutt, a veteran shell collector and former good friend of the Museum. I feel certain that this is the species referred to in the coast pilot, not only because it is found at Magdalena Bay, but because it is a well-known pelagic form along the west coast. Regarding its abundance, Stimpson, at the end of his original description, says:

"'This species lives in the open ocean, and is sometimes found in vast quantities in the Pacific off the American Coast. It was taken by Mr. Grayson in N. lat. 24°, W. long. 130°. In March, 1859, it was thrown ashore in considerable numbers at Monterey, California, from which place specimens were forwarded to us by Alex. S. Taylor, Esq.'

"From a letter from Mr G. E. MacGinitie of the Hopkins Marine Station at Pacific Grove, we learn of 'great quantities washed ashore on January 12, 1931, at the isthmus, Catalina Island'. In 1911 we got about two quarts in our dredge net in the course of a haul, made in 491 fathoms however, off Cape San Lucas, Lower California....You may be interested to know, on the other hand, that upwards of 300 specimens of *M. quadrispina* were taken at one time by the Albatross in 238 to 310 fathoms, off Santa Barbara Island, April 12, 1904".

There is thus reason to believe that *Pleuroncodes planipes* (Plate IV, fig. 7) was the species seen by Captain Fagerli off the Mexican coast. Perhaps also it was this species that was recorded from Callao Harbour in 1830 by Guérin Méneville (below p. 476).

Swarms of the *Grimothea* stage of *M. gregaria* have been recorded from South American waters in all months from November to May inclusive, but appear to have been seen most frequently in the early months of the year. Young (1925, p. 319) gives a table showing the recorded occurrences of shoals of *Grimothea* in Otago Harbour, New Zealand, by months from 1898 to 1924 inclusive, from which it appears that they occur throughout the year, but are most frequent during the southern summer. He says, "It will be seen that they are practically always present during December, January and February, but the extent of the shoals varies considerably from year to year. They have been exceedingly plentiful during 1923 and 1924. When the spring shoals make their first appearance the individuals are nearly transparent, the eyes and a red spot on the carapace being the most prominent features; but they grow very rapidly, and the colouring becomes a more intense red as time goes on. By the beginning of December the whole of the body is a brilliant red, with a very much darker spot on the carapace".

Most of the specimens of *M. subrugosa* and *M. gregaria* in the Discovery collections were taken during the third quarter of the moon (21 to 0 days of age); but no lunar period of swarming is indicated, as the specimens from St. 67 were taken when the moon was 12 days old, while Captain Fagerli says that the shoals of *Grimothea* and also of adult *M. gregaria* off the coast of Patagonia were seen practically daily from January to May.

CHARACTERS SEPARATING *MUNIDA SUBRUGOSA* AND *M. GREGARIA*, AND THEIR POST-LARVAL STAGES

M. subrugosa and *M. gregaria* are distinguished from each other by a number of characters which were clearly defined by Lagerberg (1906, p. 6). They are—the shape and direction of the rostral spine; the shape of the carapace and degree of development of the spines at the antero-lateral corners of it; the length of the eyestalk and shape of the cornea; the shape and spinulation of the merus of the chelae; the form of the endopodite of the external maxilliped; and the shape of the abdomen in cross-section, and its spinulation. These differences are not particularized here as they are given in detail in parallel columns by Lagerberg, but figures illustrating them are appended (Fig. 1). The most obvious distinction between the two species is, however, in the form of the eyes, and by this character alone they can be readily distinguished. In *M. subrugosa* they are directed forwards and are short, but with a large cornea, and in dorsal view with a strongly concave dividing line between cornea and stalk (Fig. 1 *c*). In *M. gregaria* they are directed outwards and the whole eye is distinctly longer, but the cornea is smaller and the line of junction between cornea and stalk is nearly straight (Fig. 1 *c′*). Dr Kemp records the following note on the colour of the species (St. 51): "In *M. subrugosa* the carapace is pale reddish brown throughout, with the transverse ridges slightly darker. The central rostral spine is reddish, but the two lateral spines white. The eyes are directed forwards in life, with the upper surface of the eyestalks white. The chelipeds have a conspicuous dark brown patch at the base of the fingers, the finger tips and the dactyli of all the walking legs being white. The large spines are everywhere white at the tip and very dark brown at the base. *M. gregaria* is very dark brown throughout, often with a bluish tinge on the back of the carapace and chelipeds, and entirely without the diversity of colouring seen in *M. subrugosa*. In life the eyes are directed outwards".

The characteristic direction of the eyes persists in most of the preserved specimens. Dr Kemp's note continues: "The early post-larval stages of the two species differ widely. In *M. subrugosa* they live on the bottom and closely resemble the adult in colour. In *M. gregaria* they are pelagic, often found at the surface; in colour they are a clear red, of great brilliance and transparency, with the stomach visible as a black mass. The food of this pelagic stage, in part at any rate, is diatoms, and individuals kept alive in a glass dish showed a strong positive heliotropism".

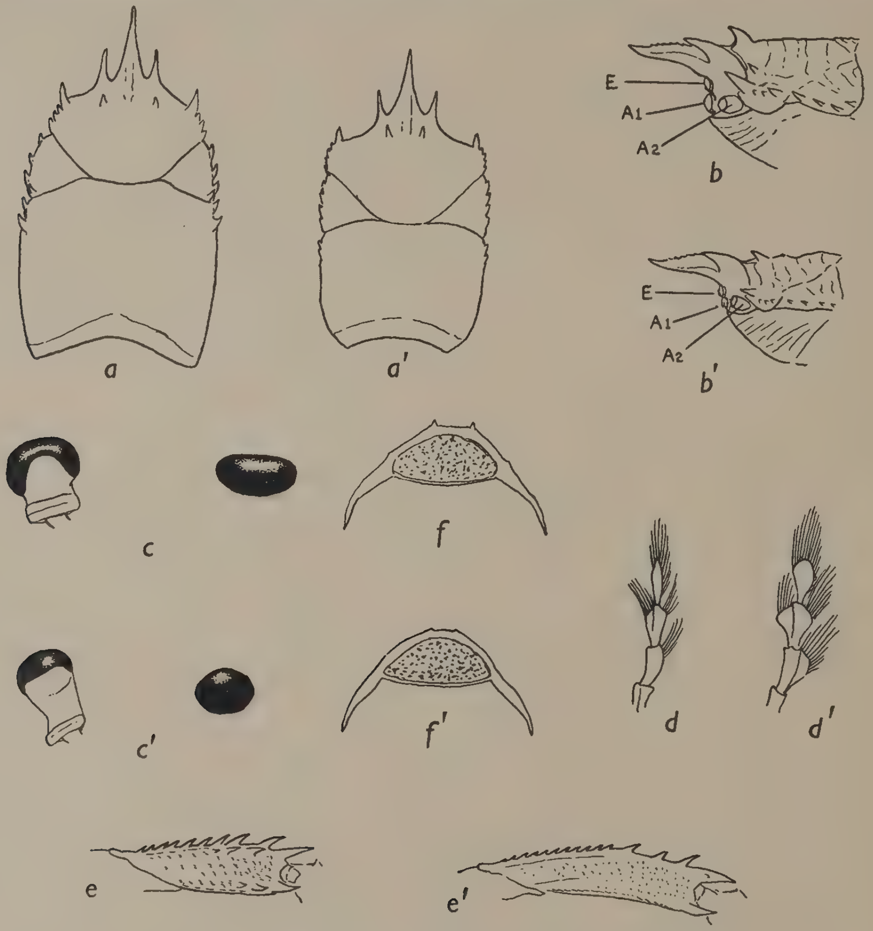

Fig. 1. *Munida subrugosa* (*a–f*) and *M. gregaria* (*a'–f'*).

a. Outline of carapace in dorsal view: × 1½.
b. Anterior part of carapace in side view: × 1½. *E*, insertion of eye; *A* 1, *A* 2, insertions of 1st and 2nd antennae.
c. Eye in dorsal and end views: × 3.
d. Terminal segments of third maxilliped: × 1½.
e. Internal surface of merus of chela: × 1½.
f. Cross-section of abdomen at 2nd abdominal segment: × 1½.

I am unable to find any important difference in structure between the early post-larval stage of *M. subrugosa* and the adult (Plate IV, figs. 1, 4).

The early post-larval *Grimothea* stage of *M. gregaria* (Plate IV, fig. 5) differs from the adult in addition to the above-mentioned characters, in size, being about 7–12 mm. in length of carapace as against the 20–38 mm. of the adult. The exoskeleton is much softer and less calcified. The spines and imbricating scales of the carapace, of the abdominal segments and of the limbs are more feebly developed than in the adult. The breadth of the carapace between the antero-lateral spines is relatively greater. The chelae and endopodites of the external maxillipeds are longer in proportion and there is a greater development of setae upon them (Plate IV, fig. 5). The Rev. T. R. R. Stebbing (1919, p. 330) records and figures an early larval stage of *M. gregaria* 2 mm. in length. I am unable to find any other description or figure of the larval stages of either *M. gregaria* or *M. subrugosa*, though Young (1925, p. 319) records from MSS. at the Otago Fish Hatchery that Anderton hatched out larvae of *M. gregaria* on September 28, 1908 and October 4, 1914.

The stage in the life history when the *Grimothea* of *M. gregaria* assumes the adult characters and takes to the bottom appears to vary. The largest *Grimothea* in the Discovery collections measures 12 mm. in length of carapace (St. 51), while the smallest *M. gregaria* with adult characters measures 13 mm. (Plate IV, fig. 6) in length of carapace (St. 51). On the other hand, the specimens taken from swarms at the surface off the Patagonian coast vary in carapace length from 18 mm. (S.S. 'Ernesto Tornquist', 27. iii. 29) to 33 mm. (S.S. 'Ernesto Tornquist', 5. iv. 29) (Plate IV, fig. 3). These appear to be adult, but all have a number of *Grimothea* characters, so that they are almost intermediate between the *Grimothea* stage and the bottom-living adult. Allowing for the fact that the specimens are preserved in formalin, whilst the remainder of the collection, with the exception of the *Grimothea* specimens from St. WS 100, are preserved in spirit, they nevertheless appear to have been less heavily calcified than specimens taken on the bottom. In addition they have a smaller development of spines, particularly those on the antero-lateral corners of the carapace, the chelae are longer and more slender and have a greater development of setae, as also do the external maxillipeds, which are longer in proportion to the total body length (cf. Plate IV, figs. 2 and 3).

This confirms in part the views of Chilton (1909, p. 612, see below, p. 479). He argues that the *Grimothea* stage may remain pelagic for a longer or shorter time, depending on the abundance of food at the surface and the availability or otherwise of a suitable bottom to which the *Grimothea* may descend and become adult. He thinks that the *Grimothea* may become bottom-living at an early age or, alternatively, may continue pelagic and become sexually mature and breed at or near the surface. The small specimen with adult characters from the bottom, and the large ones with *Grimothea* characters from the surface, recorded above, support this view. They do not, however, uphold Chilton's contention that *M. subrugosa* and *M. gregaria* are one and the same species. The abundance of the large surface-living form off the coast of Patagonia is probably due to a plentiful food supply, but what other biological or physical factors determine whether the *Grimothea* shall continue pelagic or take to the bottom are unknown. Off the Patagonian coast the swarms do not remain pelagic because there is no suitable bottom available, as the sea off this coast is very shallow up to 100 miles off shore, and the swarms were seen from the shore line out to water 70 fathoms deep. It is noteworthy in this connection that the allied anomuran species *Pleuroncodes planipes* is pelagic when adult and occurs in similar enormous swarms, as detailed above (p. 472).

NOTE ON THE HISTORY OF THE SPECIES

I place here a summary of the somewhat involved literature relating to the specific distinctions of *M. subrugosa* and *M. gregaria* and its *Grimothea* stage.

In 1793 Fabricius described the specimens of the immature pelagic form taken by Banks in the South Atlantic (latitude 37° 30′) during Cook's first voyage. These he named *Galathea gregaria*. In 1820 Leach placed the species in a new genus which he named *Grimothea*, its chief distinguishing character being the foliaceous external maxilliped. In this he was followed by Desmarest in 1825. In 1830 Guérin Méneville, in his report on the results of the voyage round the world of 'La Coquille', recorded and figured specimens from Callao Harbour. Milne Edwards, in 1837, thought he could distinguish the specimen figured by Guérin Méneville from the typical *Grimothea gregaria* by the small size of the telson and proposed the name *Grimothea Duperreii* for Guérin Méneville's specimens. This is only a synonym.

In 1843 the Erebus and Terror Expedition brought back from the Auckland Islands specimens of an adult bottom-living form with cylindrical external maxillipeds. These were named *Galathea subrugosa*, but not described, by White in 1847, in his list of Crustacea in the British Museum. The plates for the report on the Crustacea of the expedition, including figures of the species, were at that time engraved, but they were not published until 1874 (Miers, 1874, Plate 3). Dana, in 1852, in his *Crustacea of the United States Exploring Expedition* described a specimen from Tierra del Fuego and referred it with doubt to White's *M. subrugosa*. He had apparently seen the unpublished plates of the Erebus and Terror report to which he makes reference. He also recorded abundant specimens of *Grimothea gregaria* from Tierra del Fuego. He described and figured both forms. During the voyage of H.M.S. 'Nassau', 1866–9, R. O. Cunningham (1871) found *Galathea subrugosa* common in the Straits of Magellan and off the west coast of Patagonia. He also recorded *Grimothea gregaria* from the Falkland Islands and from between the Magellan Straits and the Falkland Islands.

In 1874 the report on the Crustacea of the Erebus and Terror Expedition was published, and in it Miers briefly described *Munida subrugosa*. He stated that in his opinion the specimens figured by Dana were specifically distinct as they differed in the number and arrangement of the spines on the carapace and in the shape of the hands. No mention is made of *Grimothea gregaria*, though Cunningham in 1871 had stated that he had seen a sketch of the species by Dr Hooker done from a specimen taken at the south of Tierra del Fuego during the Erebus and Terror Expedition. Filhol in 1874 recorded a large series of specimens of *Munida subrugosa* from Campbell Island and stated that they were identical with specimens from Port Famine (Straits of Magellan). He also recorded the immature form from Stewart Island and Cook Strait, and distinguished it from *Grimothea gregaria* by the slightly longer external maxillipeds (foliaceous in both forms) and named it *Grimothea novae-zelandiae*. This distinction, however, is not valid. He did not consider it to be the young of *M. subrugosa* from which it is distinguished by the foliaceous external maxillipeds. Miers, in the catalogue of New Zealand Crustacea, 1876, described *M. subrugosa* and added: "I think it quite possible that the *Grimothea gregaria*, Leach, very common at the Falklands, and in the Straits of Magellan, is the immature condition of *M. subrugosa*. The only difference of any importance between them consists in the elongated foliaceous external maxillipeds of *G. gregaria* on which Leach established the genus *Grimothea*, and it is also a much smaller species. But in a large series of specimens in the National Collection named, I think rightly, by Dr Cunningham *M. subrugosa*, and obtained at various points at the southern extremity of the American continent, there is considerable variation in the length of the external maxillipeds. On the other hand, specimens agreeing with *G. gregaria* in all respects have just been received by the British Museum from New Zealand. I have not, however, been able to observe a *complete* gradation between the two species. The hands in *G. gregaria* are granulous, in *M. subrugosa* they are usually spinulous".

Targione Tozzetti in 1877 described and figured specimens of *M. subrugosa* from western Patagonia. His specimens conformed with Dana's description and figure. In 1878 Hutton recorded specimens of *M. subrugosa* from the Auckland Islands and he evidently thought that they were a distinct species from *Grimothea gregaria* for he said, "The young specimen is quite as small or smaller than *Grimothea gregaria*, so abundant round the South Island in March, and yet it does not show the slightest approach to the foliaceous maxillipeds of *Grimothea*. The habits of the two species are also quite different. *Grimothea* is pelagic and floats on the surface of the sea, while *Munida* lives at the bottom". However, in 1881 Miers received further specimens from the Straits of Magellan taken during the survey of H.M.S. 'Alert', and in discussing these he stated that the British Museum had received specimens from New Zealand identical with those from Patagonia, though the type specimens (from New Zealand) differed slightly. From this he concluded that Dana's *M. subrugosa* was identical with that of White and of Cunningham. He also considered *Grimothea gregaria* to be only the young form of *M. subrugosa*, for which he adopted the name *Munida gregaria*.

Henderson's Challenger Report in 1888 recorded specimens of *M. subrugosa* from Patagonia, Falkland Islands, off Montevideo and Bass Strait. No specimens of *Grimothea gregaria* were taken by the 'Challenger', but two specimens were received from Wellington Museum (New Zealand). The Challenger specimens did not support the view that *Grimothea gregaria* was the young stage of *M. subrugosa*, as there were some that were not more than one-third of the size of ordinary specimens of *Grimothea*, which yet had all the characters of the adult *M. subrugosa* and were taken on the bottom along with them. Henderson, however, pointed out that the general appearance of *Grimothea* favours the theory of immaturity and that the only essential difference between *Grimothea* and *M. subrugosa* is the length and foliaceous character of the external maxilliped, which is doubtless an adaptation to pelagic life; and he admitted that it may "be possible that some of the newly hatched young pass to the surface and exist for a longer or shorter period in the *Grimothea* state". Henderson named his specimens from Bass Strait *M. subrugosa* var. *australiensis*; he distinguished them by the large development of spines and stated "in other respects this variety cannot be distinguished from the typical form of *M. subrugosa*; indeed on examining a series of the latter nearly all the abovementioned spinules can be made out in different specimens, though I have failed to see any in which so many were present at the same time".

A. Milne Edwards, in 1891, in the report of the "Mission Scientifique du Cap Horn", gave a full description of *M. gregaria* and stated that *M. subrugosa* was a distinct species, basing his separation on several characters which depend on the size and sex of the individual, and on the foliaceous external maxilliped of *M. gregaria*.

G. M. Thomson in 1898 fully discussed the question as to whether *Grimothea gregaria* is the young stage of *M. subrugosa*. He said, "*Munida* has the exoskeleton rather hard, and exhibiting considerable complexity of imbricating scales and of spines on its surface, but, with the exception of its softer and thinner texture, *Grimothea* has the same spines and markings. The difference in the length and development of the external maxillipeds, on which Leach founded the latter genus, and on which Miers and Henderson lay so much stress, is after all a comparative one. In several large males of *Munida* the joints all show the flattened and foliaceous form characteristic of *Grimothea*, as well as the densely fringing setae, while in one large female the joints are completely foliaceous. To show the relative lengths of the parts in the two forms, I append a table of measurements of a few individuals taken at random.... The relative length of the body to that of the external maxilliped is about 5 to 2 in *Munida* and 5 to less than 3 in *Grimothea*. The sexes are usually present in about equal proportions in shoals of *Grimothea*.... Out of a large number of specimens of *Grimothea* all had the pair of spines at the side of the median line of the second, third and fourth abdominal segments, said by Miers to be characteristic of *Munida*. On the other hand, several male specimens of the latter wanted the characteristic 'spine on either side of the middle of the gastric region', while in some females they were but slightly developed. Until, then, the life history of these crustaceans is worked out I am inclined to treat *Grimothea gregaria* as merely a stage in the development of *Munida subrugosa*". The specimens that he identified as *M. subrugosa* (adult) were undoubtedly *M. gregaria*, hence the confusion.

In 1902 Lenz recorded specimens of *M. gregaria* from the Patagonian region and stated that he regarded *M. gregaria* and *M. subrugosa* as different species. In the same year Hodgson recorded examples of *M. subrugosa* from Auckland and Campbell Islands and said that "general opinion" did not support the view that *Grimothea gregaria* was the young stage of *M. subrugosa*, though the only good character separating them was the form of the external maxilliped. Benedict in 1903 stated that *Grimothea gregaria* was the young stage of the bottom-living form which he called *M. gregaria*. But he was not satisfied that the bottom-living form from the Cape Horn region was identical with that from New Zealand waters, which he consequently listed as *M. subrugosa*. He did not, however, state whether he regarded the *Grimothea* of New Zealand waters as the young of *M. gregaria* or of *M. subrugosa*. Previous authors nevertheless have stated that they had specimens in every way identical from both localities.

In 1906 Lagerberg, working on the plentiful material of the Swedish South Polar Expedition, gave a comparative account of the species *M. gregaria* and *M. subrugosa*, showing that they differ in the form of the rostrum, the shape and spinulation of the carapace, the shape of the abdomen, the shape of the eyes and eyestalks, in the shape and spinulation of the chelae, and in the form of the external maxilliped.

Chilton in 1909 discussed the relationship between *Grimothea gregaria* and *M. subrugosa* and came to the conclusion that there was one species only. He said, "It is of course only natural that the immature form should be pelagic in habit, while the mature form inhabits the bottom of the sea; and it seems likely that in this case, just as in some other well-known animals, the immature stage may under certain circumstances be prolonged, and even become sexually mature without completely losing its immature characters. I consider then that the foliaceous maxillipeds of *G. gregaria* are associated with its pelagic habit, and that in the absence of favourable circumstances (e.g. a suitable sea bottom at moderate depth) it may continue pelagic, increase in size, and even become sexually mature without losing its foliaceous maxillipeds; but if it reaches a suitable locality it adopts a more sedentary life on the bottom of the sea and in its subsequent moults the external maxillipeds tend to become shorter and less foliaceous and are infolded instead of being kept extended as in the pelagic form". This opinion appears to be arrived at through confusing the adult *M. gregaria* and *M. subrugosa*, and in ignorance of Lagerberg's earlier paper.

In 1911 Ortmann recorded specimens of both species from Patagonia and verified the differences recorded by A. Milne Edwards. The Rev. T. R. R. Stebbing in 1914 recorded specimens of both species from the Falkland Islands, but noted Chilton's view, and pointed out that the generic name *Grimothea* appears to have precedence over *Munida*. In 1919 the same author recorded a very early zoea stage from the Falkland Islands.

EARLY RECORDS OF SHOALS OF THE *GRIMOTHEA* STAGE OF *M. GREGARIA*

Shoals of the pelagic *Grimothea* stage of *M. gregaria* have been noticed and recorded by navigators from as early as the sixteenth century.

In 1594 Sir Richard Hawkins ran into a cove in the Straits of Magellan of which he says, "They sounded a cove some sixteene leagues from the mouth of the Straite, which after we called Crabby Cove. It brooked its name well for two causes; the one for that all the water was full of a small kind of red crabbes; the other, for the crabbed mountains which overtopped it; a third, we might adde, for the crabbed entertainment it gave us".[1]

In 1598 when Simon de Cordes, Sebald de Wert and Dirk Gherritz were sailing south on March 12, "having passed Rio de la Plata, the sea appeared as red as blood. The water was full of little red worms which, when taken up, jumped from the hand like fleas. Some were of the opinion that at certain seasons of the year the whales shake these worms off from their bodies, but of this they have no certainty".[1]

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[1] Hawkins, Sir Richard, *Observations in his voyage into the South Sea*, 1593. London, 1622.

The chronicler of the voyage of Schouten and Le Maire in 1615 says, "towards 35½° [south] we saw those insects of which Sebald de Werd had spoken to us, and which made the sea quite red", while L'Heremite, when sailing for the coast of Brazil from Annobon which he had left on November 11, 1623, "on the 19th and 20th of January 1624 observed the sea discoloured with an infinite number of small shrimps".[2] On January 30 he made Cape de Penas, Tierra del Fuego.

Captain John Narborough, commanding H.M.S. 'Sweepstakes', in 1670, records, "Tuesday February 1st. Foggy weather; several beds of sea weeds floating in the water and sea fowls striking about them for small fish. It fell calm in the afternoon; we had many small shrimps about the ship and eight young seals came close to us. This evening I sounded but had no ground at 130 fathoms....February 5th. We were this day in latitude 41° S and longitude west from the Lizard 52° 50′".[3]

Dampier says, in the account of his voyage round the world, under January 28, 1683, "The day that we made these islands [the 'Sibbel de Wards', now called the Jason Islands, off the north west point of the Falkland Islands] we saw great Sholes of small Lobsters, which coloured the Sea red in spots, for a mile in compass, and we drew some of them out of the Sea in our Water-buckets. They were no bigger than the top of a Man's little Finger, yet all their Claws, both great and small like a Lobster. I never saw any of this sort of Fish naturally red but here; for ours on the *English* Coast, which are black naturally, are not red till they are boiled: neither did I ever anywhere else meet with any Fish of the Lobster-shape so small as these; unless, it may be, Shrimps or Prawns: Capt. *Swan* and Capt. *Eaton* met also with Sholes of this Fish in much the same Latitude and Longitude".[4] Cowley, who sailed with Dampier, also records the occurrence of the red lobsters.

In 1696 De Gennes, sailing down the Patagonian coast at the end of January, found "the sea so covered with little lobsters that one could say the sea was red with them. We took up more than ten thousand of them in baskets".[5]

Le Hen-Brignon records that on March 7, 1747, in 42° 22′ S, off the coast of Patagonia, "at 6 in the evening we saw an enormous number of little red fish, of the size and shape of a small lobster. They had two fairly long pincers at the front of the head".[5]

Commodore Byron says that on November 14, 1764, "the sea appeared as red as blood, being covered with a small shell fish of that colour, somewhat resembling our crayfish, but less, of which we took up great quantities in baskets".[6] The following day his position was 45° 21′ S, 63° 2′ W.

[1] Translated from Des Brosses, *Histoire des Navigations aux Terres Australes*. Paris, 1756.

[2] Prior, S., *All the voyages round the world*. London, 1820.

[3] Burney, J. A., *Chronological History of Voyages and Discoveries in the South Seas*. London, 1803–17.

[4] Dampier, W. A., *New Voyage Round the World*. 7th edition, London, 1717.

[5] Translated from Des Brosses, *Histoire des Navigations aux Terres Australes*. Paris, 1756.

[6] Hawkesworth, *Account of the Voyages undertaken by order of His present Majesty for making Discoveries in the Southern Hemisphere*. London, 1773.

Captain Wallis, commanding H.M.S. 'Dolphin', says that when in 48° 56′ S, 65° 6′ W, on December 9, 1766, "this day we saw such a quantity of red shrimps about the ship that the sea was coloured with them".[1]

Sir Joseph Banks during Cook's first voyage found *Grimothea* off the coast of Patagonia. He says,[2] "2nd January 1769. Met with some small shoals of red lobsters, which have been seen by almost everyone passing through these seas; they were, however, so far from colouring the sea red, as Dampier and Cowley say they do, that I may affirm that we never saw more than a few hundreds of them at a time. We called them *Cancer gregarius*". On his return he sent his specimens to Fabricius who first described the species scientifically and named it "*Galathea gregaria*".

It is apparent from most of the above accounts that the animals referred to are the pelagic *Grimothea* stage of *M. gregaria*.

LOBSTER-KRILL THE FOOD OF BIRDS AND FISHES

As would be expected, the abundant shoals of the *Grimothea* stage of *M. gregaria* are eagerly preyed upon by other animals. Thomson, 1898, records that "*Grimothea* occurs in our [New Zealand] seas, especially in the summer months, in enormous shoals, which frequently colour large areas bright red. These shoals consist often of immense numbers of individuals, of which such masses are thrown up on the beaches as at times to create a stench.... They constitute a very common article of food for both fishes and sea birds. Even in midwinter when none have been seen swimming about, I have got them in hundreds in the stomachs of red- and blue-cod and hapuku". Anderton, 1906, says, "During the season that the 'whale feed' is in the ocean and the bay the stomachs of almost all fish, including flat fish, have been found to contain large numbers of them, and it is certain that they constitute one of the most important fish foods, and no doubt play a considerable part in the migration of many fish".

E. R. Waite, 1909, speaking of the Auckland Island Shag says, "One of the most striking features of the voyage was presented during our passage down the Auckland coast. In the offing the sea was black in patches with shags, and by the aid of a glass or when sufficiently near to such a body we noted that considerable commotion was taking place. The birds were evidently feeding; their food, whatever its nature, being scattered over wide areas, but evidently closely packed where it occurred. At the time I considered the birds were catching fish, but later changed my views. It is quite impossible to convey any idea of the number of birds thus engaged. In passing from the shore to their feeding grounds, or in the reverse direction, their flight behind, over and in front of the vessel was a constant stream, and this continued for many miles. The birds returning to the shore were noticed to be heavy with food; their bodies were fully distended and the flight in consequence distinctly laboured....A flat stretch of rock below our camp at the Auckland Islands proved to be a favourite assembling ground for shags and we had no trouble in observing them....I examined the stomachs of others and found them to be crowded with small crustaceans resembling *Munida*: one contained small fish bones in addition.... I examined the stomachs of our captures and in every case found them to contain the reddish mass which I have above attributed to partially digested *Munida*. Since the foregoing was written Prof. Benham writes to me, 'the Shags that were opened had the stomach filled with the crustacean *Munida subrugosa*'".

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[1] See note 6 on p. 480.

[2] Banks, Sir J., *Journal during Captain Cook's first voyage*. Ed. Sir J. Hooker. London, 1896.

Young (1925) says, "When the shoals are on the surface [of Otago Harbour] the stomachs of most of the fish caught are found to be crammed with whale feed".

LOBSTER-KRILL AS WHALE FOOD

M. gregaria is the species to which the term "lobster-krill" is mainly applied, though, as is shown above, *Pleuroncodes planipes* is also probably included under this name. In New Zealand the *Grimothea* stage of *M. gregaria* is known as "whale-feed". Chilton in 1904 appears to be the first to print this name, and Anderton in 1906 and Young in 1925 use the same expression.

In 1926 Sir Sidney Harmer received from the New Zealand Government Offices in London a series of photographs of whaling in New Zealand waters. Copies of seven of the photographs are now in the British Museum. These show phases of the chase and capture of Humpback whales from motor launches in the waters of Cook Strait. The most interesting photograph, however, is of ten specimens of the *Grimothea* stage of *M. gregaria*. This photograph is labelled "Euphausians or Plankton. Alive whale's feed on a plate (so called), like small lobsters and red. The sea is red for acres and humpback whale open their mouths and swim through". The photograph shows quite clearly and unmistakably that the whale-feed is the *Grimothea* stage of *M. gregaria*. Mr Drew, Publicity Officer at the New Zealand Government Offices, kindly informed the writer that the whaling station at which these photographs were taken is known as Te Awite and is situated in the South Island on the shore of Tory Channel which connects Queen Charlotte Sound with Cook Strait. He has himself seen the sea coloured red by "whale-feed" over large areas in Cook Strait, and he understands that similar shoals are met with on the whaling grounds off Cape Brett, Bay of Isles, on the east coast of the North Island.

It is clear, then, that the *Grimothea* stage of *M. gregaria* forms the food of the Humpback whale in New Zealand waters, at least on occasion. From the great abundance of the shoals of "whale-feed" it appears to be probable that their occurrence may have an important bearing on the migrations of the Humpback whale in the New Zealand seas.

I am able to record that other species of whale also feed upon the shoals of *M. gregaria*, both in the adult and *Grimothea* stages. A whaling station operated from 1908 to 1916 at New Island in the Falkland Islands, where *Grimothea* is known to be plentiful at times. The *Grimothea* has features so distinctive that it needs no scientific training to recognize it as different from the usual Euphausian krill eaten by whales, and consequently the writer sought information on the point. However, as the station at New

Island was closed sixteen years ago, it is difficult now to trace anyone who worked there or who would be able to give reliable information on the question. Herr Sigurd Risting, of Sandefjord, Norway, is likewise unable to trace anyone at this distance of time. Dr Kemp adds that he has made many enquiries without result. The information received from Captain Fagerli, however, shows that on the Patagonian coast *M. gregaria* and its *Grimothea* stage form the food of the Sei whale. During the seasons 1927–8 and 1928–9 between 1300 and 1400 Sei whales were taken, all of which were feeding on lobster-krill. Both adult *M. gregaria* and the *Grimothea* stage were found in the whales; nearly always the stomachs contained either adults or *Grimothea*, rarely both. Many whales were taken feeding at or near the surface, but there is no evidence indicating that any were feeding on adult *M. gregaria* at the bottom. The same lobster-krill was also found in Humpback and Right whales, two of the former and three of the latter having been taken. Three Blue whales were taken, but none had this krill in the stomach. In 1926 at Magdalena Bay on the Pacific coast of Mexico where similar shoals, presumably of *Pleuroncodes planipes*, were seen, the Sei, Humpback and Pacific Grey, but not the Blue whales, were found to be feeding on these crustacea.

Captain Fagerli noticed that the blubber oil obtained from Sei whales on the Patagonian and Mexican coasts was always of a definitely yellowish colour, quite unlike that obtained from this species elsewhere. He believes that the difference in colour is produced by feeding on lobster-krill.

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PLATE IV

Fig. 1. *Munida subrugosa*. ♂ from St. 51, 37 mm. in length of carapace. Note forwardly directed eyes and characters of endopodite of third maxilliped.

Fig. 2. *Munida gregaria*. ♂ from St. 51, 38 mm. in length of carapace. Note outwardly directed eyes and characters of endopodite of third maxilliped.

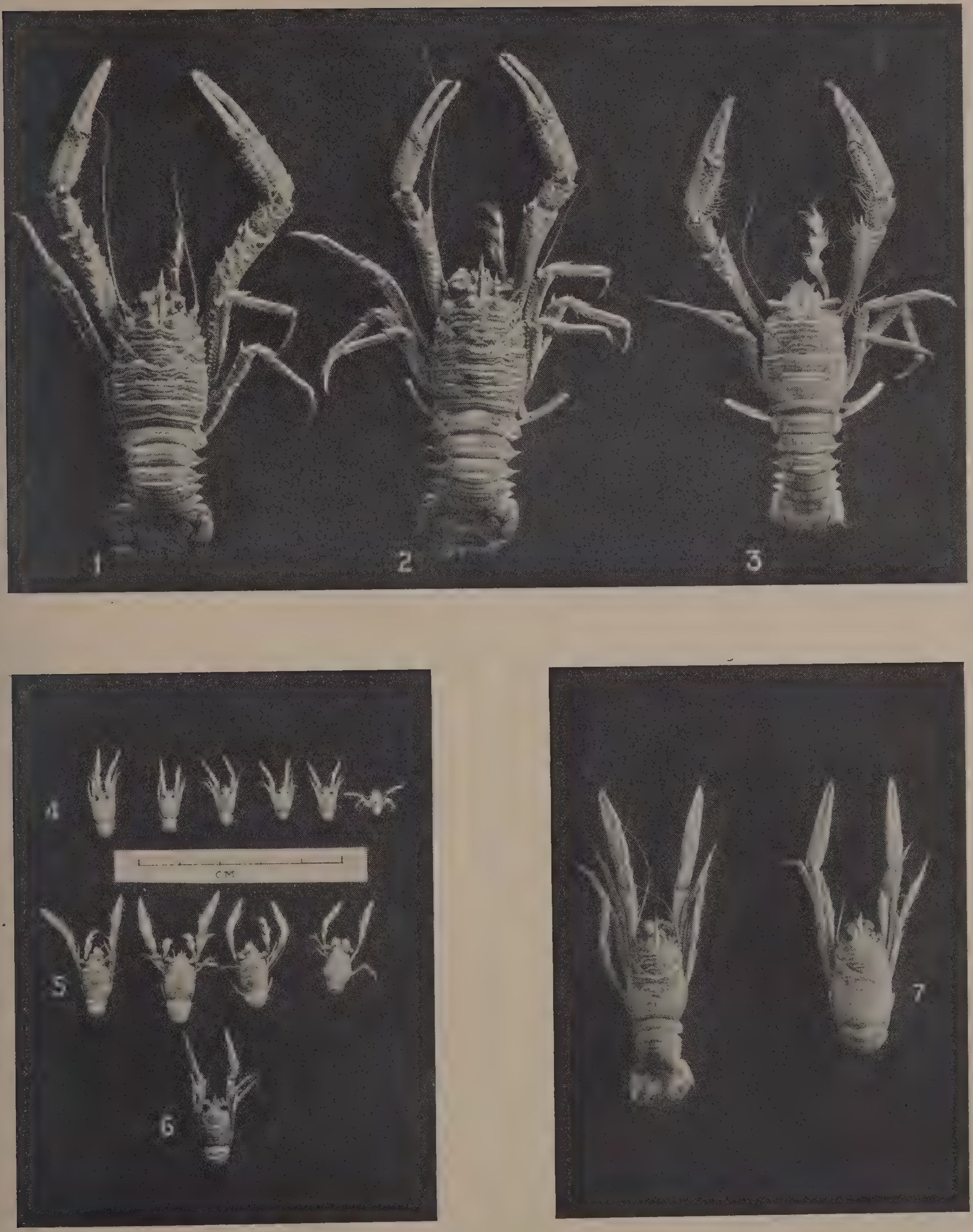
Fig. 3. *Munida gregaria*. ♂ collected by the S.S. 'Ernesto Tornquist', 33 mm. in length of carapace. Note broadly foliaceous endopodites of third maxilliped and slender merus of chelae.

Fig. 4. *Munida subrugosa*. Post-larval young from the bottom: St. 51.

Fig. 5. *Munida gregaria*. Post-larval pelagic young (*Grimothea* stage): St. 67.

Fig. 6. *Munida gregaria*. The smallest specimen with adult characters in the collection. Length of carapace 13 mm.: St. 51.

Fig. 7. *Pleuroncodes planipes*. ♂ (left) and ♀ (right) from Magdalena Bay, Lower California, kindly supplied by Dr Waldo L. Schmitt.



LOBSTER-KRILL: *MUNIDA* AND *PLEURONCODES*

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